

2007 TRAINING MANUAL FOR LANDFILL OPERATORS & MANAGERS



Division
of Waste
Management

Prepared for:



Energy and Environmental Cabinet

KY Department of Environmental Protection

Division of Waste Management

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CHAPTER 1

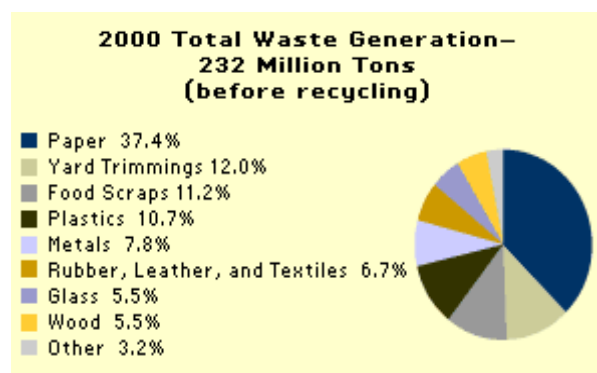
WASTE MANAGEMENT IN KENTUCKY

This section explains why and how solid waste is managed in Kentucky and discusses the roles of those involved in disposal.

WASTE GENERATION AND CHARACTERISTICS

Kentucky citizens currently generate over 5 million tons of solid waste annually. Each person produces over 1,400 pounds per year or approximately 3 to 4 pounds per day. The amount of waste produced continues to increase each year.

Commercial and industrial firms also produce solid waste. Each type of business produces a different amount and type of waste. A rate of 4.7 pounds per person per day disposed in contained landfills only is used by the Division of Waste Management (here after the Division) to estimate the amount of commercial and industrial waste generated in Kentucky. Some wastes may be disposed of at landfills. Other wastes may require another disposal method.



Nationwide, the Environmental Protection Agency (EPA) reports that In 1999, U.S. residents, businesses, and institutions produced more than 230 million tons of MSW, which is approximately 4.6 pounds of waste per person per day, up from 2.7 pounds per person per day in 1960.

In Kentucky, waste is classified as either solid waste or hazardous waste. **Solid waste** is any garbage, refuse, sludge, or other discarded material. **Hazardous waste** is material that, because of its characteristics, quantities, or concentrations, may present a hazard to human health or the environment when improperly disposed.

Landfill operators must have a thorough working knowledge of various waste streams since not all wastes may be accepted at a landfill. A variety of waste streams may be accepted at a landfill; however, some of these waste streams may require unique handling methods. The Waste Streams and Handling Section of this manual explains waste streams in detail.

NEED FOR PROPER MANAGEMENT

Over the years, the lack of comprehensive waste management systems has allowed thousands of open dumps to be created across the state. It is estimated that over 450 thousand tons of waste are disposed of illegally in Kentucky each year. Illegal dumping results from low collection rates and the public's misunderstanding of the effect illegal disposal has on public health and the environment.

Open dumps are breeding grounds for disease vectors such as rats, flies, fleas, mosquitoes, and birds which carry and transmit pathogens creating potential health hazards. Twenty-two (22) human diseases have been traced to improper solid waste management.

In addition to the direct health impacts of open dumps, communities may face impacts from:

- lowered community's self esteem and property values,
- contaminated drinking water supplies,
- safety hazards (accident rate for sanitary workers is 4 1/2 times greater than the next most hazardous industry - coal mining),
- odors and methane gas from decaying vegetation and garbage,
- land removed from other productive uses (wildlife habitat, residential, etc.),
- increase threat of forest fires (open dumps are a major cause),
- direct costs to property owners and public agencies for cleanup (During the 1998-1999 fiscal year the state highway department collected more than 96,000 bags of roadside litter, which took a total of 215,670 man hours at a cost of \$3,961,000 for roadside litter cleanup alone), and
- reduction of a stream's carrying capacity resulting in increased flood heights during storms.

Waste generated by our communities must be stored, collected, and disposed of properly to protect public health and the environment. Good management practices will also minimize the economic and social costs associated with indiscriminate dumping. HB 174 will provide Kentucky counties with the opportunity to receive funding for cleanup of illegal dumps. See following section for summary of HB 174 as passed.

SUMMARY OF HB 174

HB 174, as passed:

- Establishes priorities for proper solid waste management in Kentucky through waste reduction, recycling, proper closure of abandoned landfills, education, proper collection and disposal of solid waste, elimination of illegal open dumps and abatement of litter.
- Identifies counties as being in best position to plan for solid waste collection, with technical and financial assistance from the state.
- Creates revenue to begin to address some of the priority issues: abandoned landfills, illegal dumps and litter.
- Revenue will be generated through; \$25 million bond sale, \$1.75 environmental fee assessed on each ton of waste disposed in municipal solid waste disposal facilities, and \$5 million annual transfer from highway road and contingency funds.
- Kentucky Pride Fund established to receive funds, which will be administered by the Energy and Environmental Cabinet.
- \$1.75 environmental fee on waste disposed at municipal solid waste disposal facilities to be collected at transfer stations or contained landfills in the Commonwealth.
- Cabinet to develop regulations with a formula for estimating tons of waste at transfer stations without scales. Notice of Intent published July 1, 2002, with NOI public hearing on July 30, 2002. Draft regulation filed November 1, 2002 for 30-day public comment period.
- Revenue generated from all sources expected to be approximately \$32.5 million in first year (FY 03), and \$14.8 million in ongoing revenue for the following years.
- The \$25 million dollar bond and \$5 million from the environmental fee to be used by the Cabinet for the identification and closure of abandoned landfills, as well paying debt service on the bond.
Bond can only be issued upon approval of state budget.

- Interest on Pride Fund, up to \$1 million, will fund Kentucky Environmental Education Master Plan.
- The remaining environmental fee revenues and road fund monies (expected to be \$9.8 million annually) are to be used by the counties and cities for the cleanup of illegal dumps and litter.
- Counties and cities will receive litter monies based on their population and road miles.
- Counties must clean roadsides three (3) times a year, and cities must clean city streets two (2) times a year.
- Cabinet will prioritize illegal dumps based on health and environmental risk in first year.
- Cabinet will reimburse counties for illegal dump cleanup, with county providing 25% match.
- Counties must have approved solid waste management plan to receive reimbursement.
- Requires counties to have a solid waste coordinator with enforcement powers.
- Gives solid waste coordinators additional authority to issue citations for illegal dumping and littering.
- Requires waste haulers and recyclers to register and report to counties in which they operate.
- Suspends until July, 2006, Cabinet enforcement actions against counties and cities regarding abandoned landfill closure.
- Cabinet must present a plan to legislature by December '04 for closure of remaining abandoned landfills, with recommendations for funding.

MANAGEMENT PRACTICES

Solid waste requires both short and long term management by local and state agencies as well as private industry. Management practices include:

- landfilling,
- local solid waste management plans,
- source reduction,
- recycling,
- collection,
- incineration,
- resource recovery, and
- public education.

SOLID WASTE MANAGEMENT PLANNING

KRS 224.40-315 requires counties to develop and implement a solid waste management plan that shall be updated every five years. The first five year plan for each county began in 1992; the second five year plans are effective for the period of 1998-2002. The governing body, in most instances the fiscal court of a county, is responsible for implementing the solid waste management plan, submitting a completed annual report and responding to local determination requests.

Each plan must address the following components and demonstrate the tasks the county will implement for each component on an annual basis:

- collection of municipal solid waste,
- disposal,
- recycling/reduction,
- cleanup of litter and open dumps,
- enforcement of local and state laws regarding solid waste management,
- siting of solid waste management facilities, and
- educational efforts for schools and the public at large for all components.

SOURCE REDUCTION

Source reduction is normally practiced at the corporate level to reduce the amount of waste having to be managed. An example of source reduction would be for a manufacturer to eliminate extra packaging around their products, design the product to be more durable (e.g., refillable lighters vs. disposal lighters), or to

eliminate a toxic chemical from the manufacturing process. This slows the depletion of natural resources, prolongs the life of disposal facilities, and can make incineration and landfilling safer by removing toxins. While local waste handlers do not use source reduction for managing waste that is collected, it is a technique everyone can promote through selective buying habits (purchasing products which can be recycled).

Using 1993 as a baseline year, the 1991 Kentucky General Assembly passed legislation aimed at reducing the amount of waste going to Kentucky landfills by 25 percent. This goal was to be met by 1997; however, because of the increased collection of solid waste and the initiative to cleanup open dumps across the state this goal has not been met. This initiative identified literally thousands of open dumps located across the state. In turn, this has led to a massive cleanup that still continues today.

RECYCLING

Recycling is the separation of a given waste material (e.g., glass, plastic, aluminum, etc.) from the waste stream and processing it to be used again as a raw material. Recycling can also be viewed as a profit making venture, an avoided disposal cost, and/or a way of preventing potentially useful materials from being burned or buried. Operators are familiar with the types and quantities of waste placed in the working face. This provides the landfill's management and operators with the opportunity to identify large amounts of similar wastes (e.g., wood pallets, slightly damaged products, tires, etc.), separate out these items, and sell them or recommend to the generator that they be removed from the waste stream.

COLLECTION

One of the major goals in development of a solid waste management plan is to increase residential collection. Rural collection is low in many counties, but gains are being made as a result of increased attention to the problem. In 1983, door-to-door collection was available to two-thirds of Kentucky's residents by 1985, collection was made available to 73 percent of the residents. 120 counties have now implemented universal collection systems. This means that access for collection of waste is available to all citizens. Currently 26 counties have mandatory collection of their solid waste.

Types of door-to-door collection systems include:

- private haulers,
- permit haulers,
- franchise haulers,
- municipally owned systems, and
- can include staffed convenience centers or transfer stations

Door-to-door collection systems utilized by counties are defined as follows:

- Private hauler - No permit required; hauler may provide service throughout the area.
- Permit Local - Government requires haulers to obtain a permit in order to operate in the county. Permit haulers may also provide service throughout the county.
- Franchise - The county awards a franchise to hauler(s) based on a winning bid. Franchise areas can include one or more designated areas of a county.
- Municipal - A collection system that is owned and operated by county government.
- Convenience Centers/Transfer Stations - Can be used as a direct haul collection system in conjunction with any of the preceding collection systems or can be used as the only system.

Universal collection is defined as "a municipal solid waste collection system that is established by ordinance, is approved by the Energy and Environmental Cabinet (Cabinet) and requires access for each household or solid waste generator in a county."

INCINERATION (TREATMENT)

Incineration is the controlled burning of waste in an engineered structure and is useful in reducing the bulk associated with solid waste. Although not risk free, a state-of-the-art incinerator that is well operated should not present a risk to human health and the environment. The Cabinet's Division for Air Quality and Division of Waste Management regulate incinerators. Residual ash from incinerators is regulated by the Division of Waste Management and must be disposed of at a permitted contained landfill.

RESOURCE RECOVERY (TREATMENT)

Resource recovery is a treatment process in which the energy produced (heat) from burning the waste is used to produce steam for heating or the production of electricity. The permitting is identical to incineration. Resource recovery has not yet become a viable alternative for waste management in Kentucky. Waste-to-energy projects are often unable to compete economically with landfill operations for the following reasons:

- capital cost (minimum of \$3.5 million for a 50 ton per day plant),
- lack of long term secure markets for energy produced,
- low population,
- incomplete collection systems, and
- the low market price for coal which has about the same BTU value.

TDF (Tire Disposal Facility): Kentucky generates 5 million tires per year. One utility in western Kentucky is burning tire fuel, or chipped tires. This used 1 million tires per year. Two more potential sites in northeast Kentucky would use the rest of the scrap tires. The permitting is the same as incineration and resource recovery.

LANDFILLING (DISPOSAL)

The solid waste management program was initiated by Kentucky in 1968 and permits for disposal were issued shortly thereafter. In 1983, Kentucky had 97 landfills, however, due to noncompliance with state regulations and exhaustion of landfill space, the state now has only 27 contained landfills that will accept Municipal Solid Waste (MSW). These numbers are subject to change due to changes in permit status and new permit applications. The siting of new landfills is difficult in Kentucky due to:

- karst terrain,
- high rainfall,
- high groundwater,
- steep terrain, and
- public opposition

Landfills will continue to be the primary method of solid waste disposal for the foreseeable future. Kentucky currently depends 100 percent on land disposal of its solid waste. While recycling, resource recovery, and incineration of solid wastes will reduce the volume of waste, landfills will still be needed for disposal of

incinerator and resource recovery ash and waste not diverted from the process. The increasing cost of landfill construction and operation will encourage the development of larger landfills to meet multi-county and regional needs.

PUBLIC EDUCATION

There is a great need for public education regarding solid waste issues. However, public education usually suffers the first cuts during tight budget periods and is most often written into the planning process as an afterthought or luxury item. Public education activities are essential to effective solid waste management. Therefore, this issue has become an integral part of the training and technical assistance rendered by the Cabinet.

The Cabinet is involved in many activities that foster public education. Public education involves the distribution of information and delivery of presentations along with other one-way communication to the public. These activities include technical assistance, networking with other state agencies, production of bulletins and newsletters, clean community programs, and special presentations.

KENTUCKY REGULATIONS

In the late 1980s, waste management issues became a public focal point in Kentucky and across the nation. Faced with pending federal Subtitle D criteria, increased usage of Kentucky landfills by northern states, new scientific and empirical data on solid waste management facilities and increased public concern, the Division drafted new solid waste management regulations. The regulations found in 401 KAR Chapters 30, 47, 48, and 49, address solid waste planning requirements, design, and operational standards applicable to all solid waste sites or facilities.

ENVIRONMENTAL PERFORMANCE STANDARDS

The Environmental Performance Standards (401 KAR 47:030) outline the minimum requirements to assure disposal sites or facilities do not pose an unreasonable risk or adverse effect on human health or the environment. The rule is similar to 40CFR257, which was promulgated by the U.S. EPA. All solid waste management facilities in Kentucky must demonstrate compliance with these standards. Sites failing to meet these standards are considered open dumps, which are prohibited by law. The Environmental Performance Standards (EPS) are categorized by site selection, landfill operation, and safety.

SITE SELECTION STANDARDS

- **Floodplain control** -A waste disposal site cannot be located in a floodway, restrict the flow of the 100 year flood, reduce the water storage capacity of the floodplain, or result in the washout of waste. A contained landfill cannot be constructed in the 100 year floodplain.
- **Water pollution control** - The site cannot contaminate ground water sources within 250 feet of the waste boundary in excess of the maximum contaminant levels identified in 401 KAR 47:030. The site may not discharge to surface waters without a KPDES permit.
- **Groundwater protection** - A facility must have more than 4 feet of compacted earth between the bottom of the landfill and the seasonal high water table or bedrock.
- **Endangered plants and animals** - A facility cannot be located where any federally protected endangered plants, fish, wildlife or their habitat would be threatened.

LANDFILL OPERATIONAL STANDARDS

- Disease vector controls - flies, rats, birds, and mosquitoes must be controlled through the application of daily cover material or other techniques.
- Open burning and violation of applicable air pollution requirements (KRS 224 and 401 KAR Chapters 40 to 63) are prohibited.
- Owners or operators must control litter.

SAFETY STANDARDS

Public access control, specified methane gas limits, a contingency control plan, required fire control, a communications plan, and application of cover material are all components of a landfill's basic safety plan.

LANDFILL/PERMIT CATEGORIES

The following section outlines the solid waste permit types, which are classified, based on the waste managed and facility type.

A sanitary landfill is a solid waste facility permitted for the disposal of solid and non-regulated hazardous waste. Because of differences in waste types and disposal methods, solid waste disposal landfills are divided into 3 categories:

1. **Contained landfills** are facilities designed and permitted for the disposal of solid wastes including:

- non-hazardous solid waste (residential, commercial, institutional, industrial and municipal waste),
- shredded tires,
- whole OTR (off-the-road) tires,
- household hazardous waste,
- limited quantity generator hazardous waste, and
- non-hazardous spill clean-up residues.

Technical requirements for contained landfills are found in 401 KAR 48:050 and 48:070 through 48:090.

2. **> 1 Acre Construction/Demolition/Debris (C/D/D) landfills** are facilities designed and permitted for the disposal of solid wastes including:

- materials from the construction, remodeling, repair, or demolition of structures and roads (i.e., bricks, shredded tires, drywall, plumbing fixtures, paper products, furniture, shingles), and
- vegetation from land clearing and grubbing, utility line maintenance, and seasonal and storm related cleanups (i.e., soil, tree stumps, sawdust, yard waste).

Technical requirements for >1 Acre C/D/D landfills are found in 401 KAR 48:050 and 48:060.

3. **Residual landfills** are facilities designed and permitted for the disposal of specific solid waste(s) or residue(s), which can be fully characterized (i.e., has a limited number of hazardous constituents that a lab may identify and quantify). Special wastes, defined as low in hazard, high in volume, may also be disposed of in a residual landfill. Examples of residual wastes include:

- industrial process waste,
- utility wastes (i.e., fly ash and flue ash),
- cement kiln dust, and
- wastes from air and water pollution control devices.

Technical requirements for residual landfills are found in 401 KAR 48:050 and 48:170.

Residential and inert landfills are no longer recognized as landfill permit categories. Residential landfills had the option of converting to a contained or C/D/D landfill, provided relevant operating standards were met, or closed in accordance with 401 KAR 47:080, Section 5(1) before July 1, 1992. Inert landfills either converted to a C/D/D or residual landfill, provided relevant operating standards were met, or closed in accordance with 401 KAR 47:080, Section 5(3).

LANDFARMING AND COMPOSTING

Landfarming is a category of permit, which allows solid waste and special waste to be surface applied or injected into the upper layer of soil to improve soil quality or provide plant nutrients. Composting is a method of solid waste and special waste management whereby organic wastes are decomposed, in a controlled setting to produce a material that can be applied to supplement the soil. Technical requirements for the solid waste registered permit-by-rule category are found in 401 KAR 48:200. The technical requirements for special waste formal permits are found in 401 KAR Chapter 45.

Solid and special wastes suitable for landfarming or composting include:

Solid waste:

- food processing wastes and,
- yard waste.

Special waste:

- wastewater plant biosolids, and
- water plant sludge

PERMIT-BY-RULE

Certain classes of solid waste disposal sites or facilities are presumed to hold a permit without the owner submitting an application to the Cabinet. Because all waste disposal facilities must be permitted, the rule grants the authority to operate. The Division has incorporated the following 13 general permit categories.

- sawdust piles,
- asphalt residue,
- waste piles,

- Less than 100 tires, shredded tires occupying less than ¼ acre or tires used in farming operations,
- oil production related wastes,
- salvage yards,
- surface impoundments with a KPDES permit, and
- one-time disposal of waste construction or demolition material at the place of generation.
- When a permit-by-rule site is in known violation of the EPS, the permit-by-rule is revoked, the site is required to modify its operation to conform to the EPS and obtain a permit or close.

BENEFICIAL REUSE OF SOLID WASTE

Beneficial reuse of solid waste encompasses a one-time disposal of demolition wastes such as concrete slabs, brick, concrete block, or similar material, or coal ash and steel slag to provide structural inert support for buildings

REGISTERED PERMIT-BY-RULE

This category of solid waste sites or facilities requires the registration of certain types of management, processing, or disposal facilities. The purpose of this registration is to identify additional facilities for the management and measurement of Kentucky's waste stream.

Facilities that fall under this category include:

- < 1 Acre C/D/D landfills,
- recovered materials processing facility” in KRS 224.01-010
- transfer stations,
- solid waste incinerators with a design capacity of more than 1 ton per day,
- sludge giveaway programs,
- Class 1 landfarming sludges,
- septic tank pumpings, and
- convenience centers.

Registered Permit-by-Rule Facilities must submit a registration form to the Division, comply with the Environmental Performance Standards and applicable operating standards, and implement any necessary corrective action. New facilities must run a public notice and register prior to startup of operation. The owner/operator may begin operations 5 days after registration without a response by the cabinet. The department has 5 days to deny the registration for

“bad actor” reasons. The owner/operator must operate accordingly or revise the registration.

OTHER PERMIT CATEGORIES

- **Emergency permits** are issued in accordance with 401 KAR 47:150 for the short term storage of solid waste generated in an emergency situation.
- **Research, development, and demonstration permits** are issued to facilities to demonstrate unproven technologies.

LANDFILLS AND PERSONNEL

All non-hazardous solid waste in Kentucky must be disposed of at a site permitted by the Cabinet's Solid Waste Branch, Division of Waste Management. Obtaining a permit and operating a solid waste site or facility requires a wide range of complex technical principles. Landfills are not abandoned holes in the ground to be filled with garbage. Constructing and operating a landfill involves budgets ranging from hundreds of thousands to millions of dollars and detailed engineering plans.

Proper management of a landfill requires the effort and cooperation of many people. In order for the permitted disposal system to achieve the goal of protecting human health and the environment, information must be exchanged among all individuals associated with the landfill. The following is a list of individuals, and their roles, involved in developing and operating a landfill.

APPLICANT

The applicant is the person who applies with the state agency for a solid waste site or facility permit. An applicant may be:

- an individual,
- government agency or subdivision (i.e., federal or state agency, fiscal court, KRS 109 Board, city council),
- company (i.e., corporation, partnership, firm), commission trust, or
- interstate body.

CONSULTANT

The engineer and geologist hired by the applicant to design the landfill must develop technical plans or drawings based on the geologic and hydrologic characteristics of the site that reflect, where applicable, local, state, and federal requirements. The engineer should be consulted during all phases (e.g. permitting, construction, operation and closure) of the site.

LOCAL GOVERNMENT

Counties are required to prepare and revise solid waste management plans as necessary. Permit applications must be consistent with these plans and local regulations or zoning ordinances.

FEDERAL GOVERNMENT

The permittee must comply with federal law including: The Wild and Scenic Rivers Act, The National Historic Preservation Act, The Endangered Species Act, The Fish and Wildlife Act, The Clean Air Act, and The Clean Water Act.

PERMIT REVIEWERS

The Division's permit reviewers include both engineers and geologists, who carefully check the contents of a landfill application to determine that the site meets regulatory requirements. A construction inspection, including testing, is also completed prior to issuing a permit.

INSPECTORS

Inspectors for the Division of Waste Management located in 10 offices throughout the state inspect each landfill approximately once per month to check the daily and long term operation. Inspections of the site are also completed prior to issuing a re-permit, or closure. A list of field offices and the counties they cover in the Appendix of this manual.

PERMIT HOLDER

Permits are issued in the name of the applicant. The permit holder may manage and operate the landfill or hire an individual(s) for these responsibilities. The permit cannot be transferred without written approval from the Division. If a landfill is sold or leased prior to closure, the successor is required to submit an application, and be financially responsible for closure.

LANDFILL MANAGER

The landfill manager is the individual with primary responsibility for management and operation of the site. Since the manager monitors the site to assure compliance with all permit conditions, the manager must have an understanding of the site's permit including the engineering plans. The manager makes long range decisions about the landfill and must communicate to the operator and permit holder the things that must be done to keep the landfill in compliance with applicable laws and regulations. This course will enable the manager to read and interpret the permit and provide guidance to both the landfill operator and permit holder.

STATE AGENCY

The Division of Waste Management is the primary state agency designated to regulate landfills. Division staff review applications for and issue/deny landfill permits. This consists of a review of the design and operational standards proposed, a past performance review of the applicant, and the relationship of the proposed facility to the local solid waste management plan. The Division also inspects landfills to monitor compliance with solid waste management regulations. Construction permits for landfills may be issued for up to 5 years. Initial operating permits are normally issued for 5 years upon completion of construction.

LANDFILL OPERATOR

The landfill operator is the person responsible for the daily operation of the landfill including: cover, compaction, monitor incoming wastes, safety, etc. The operator should be able to identify problems as they arise and report them to the landfill manager. Operation of a landfill is discussed in detail in the Operating Your Landfill Section of this manual.

CITIZENS

Citizens are clients of the landfill and can be the most vocal critics of its operation. A properly operated landfill will cause fewer complaints from citizens who live nearby. A strong citizen education program will promote a better understanding of the usefulness of a landfill and alleviate many fears associated with its operation.

OPERATOR CERTIFICATION PROGRAM

Each construction/demolition/debris landfill and contained landfill must have at least one certified landfill operator and one certified landfill manager or one individual certified for both categories. The Division may require a certified operator and/or manager at permit-by-rule, registered permit-by-rule, or residual landfill facilities as a permit condition. This requirement will be based on the characteristics of the waste stream, the site, and the experience and qualifications of the operator and/or manager.

The certified landfill operator must be physically at the facility during working hours. However, in the event the certified landfill operator cannot be at the site, the certified landfill manager or an interim operator, physically located on site, can be designated responsible for daily site operations. This provision is intended to ensure that only qualified personnel supervise landfill operations.

INTERIM OPERATOR

A new section was created to designate of an interim operator. An interim operator must be appointed whenever a certified landfill operator or manager has to be absent for an extended period. An "extended absence" means:

- more than 10 consecutive operating days for landfill operators
- more than 30 consecutive operating days for landfill managers
- more than 5 consecutive operating days for landfarming operators.

The permit holder must select the interim operator and notify the Division, in writing, 10 days prior to an anticipated absence and immediately upon discovery of an extended absence due to an emergency or unanticipated circumstance. The following information must be included in the notice:

- name and qualifications of intended replacement operator (must complete an application for operator certification (DEP 6031) to obtain this information), and
- length of replacement period.

The Division will:

- evaluate the qualifications, and
- notify the permit holder and intended interim operator, in writing, of approval or denial.

APPLICATIONS FOR CERTIFICATION

The individual seeking certification must file an application with the Division of Waste Management. The Division will review applications and supporting documents to determine the eligibility of the applicant. No one can be eligible for certification unless they complete the appropriate training class provided by the Division.

APPLICANT QUALIFICATIONS

Applicants will be evaluated on education and experience as it relates to the appropriate category of landfill. A landfill operator must have:

- completed high school, either by graduation or by obtaining an equivalency certificate, and
- one year experience.

If neither condition is met, the Division will consider the number of years experience in a related field in determining eligibility for examination on a year for year basis.

TRAINING CLASSES AND EXAMINATIONS

The Division will provide at least one scheduled training session each year. Certification will be granted at the end of the session if the applicant achieves a score of at least 70 percent on the examination. If requested, the examination can be given orally. If an individual fails the examination, the candidate for certification will be given the opportunity to re-take the examination once more without any additional charge. If the class participant fails the examination the second time, they will be required to wait until the next scheduled session to repeat the training class and examination.

ISSUANCE OF CERTIFICATES

Upon successful completion of the training session, the Division will issue both a full and wallet size certificate indicating the category of certification acquired. All landfill operators and managers are required to be recertified every 5 years.

If the certified operator terminates employment at a landfill, the certificate will remain valid until expiration or revocation. Certificates must be carried during

working hours or displayed onsite. An individual who is not certified and assumes the responsibility of operator or manager must meet interim operator requirements and attend the next scheduled training session.

RELATIONSHIP OF CERTIFICATION TO LANDFILL PERMIT

With the exception of special waste landfills, every landfill in the state is required to have and be operated by a certified landfill operator and manager. A certificate may be revoked when the Division determines:

- the certificate was obtained by fraud, deception, or submission of inaccurate data,
- the certificate holder failed to perform required duties, including failure to comply with permit conditions, or
- the certificate holder failed to use reasonable care and judgment in performance of required duties.

Maintaining a certified operator and manager at a landfill is considered a condition of the landfill operating permit. The permit may be revoked and/or penalties sought for violation of this requirement.

STUDY GUIDE

WASTE MANAGEMENT IN KENTUCKY

1. Each person in Kentucky produces approximately ____ to ____ pounds of waste per day.
2. In Kentucky, wastes are classified as either _____ waste or _____ waste.
3. Solid waste includes _____, _____, _____, or _____.
4. Hazardous waste is material that may present a hazard to _____ or the _____ when improperly disposed.
5. Each year in Kentucky over _____ thousand tons of waste may be disposed of illegally.
6. Open dumps are breeding grounds for disease vectors such as _____, _____, _____, and _____. Twenty-two (22) _____ diseases have been traced to improper solid waste management.
7. Other negative results of improper solid waste management include:

8. Proper Solid Waste Management practices include:

9. KRS 224.40-315 requires counties to develop and implement solid waste plans that must be updated every _____ years.

10. Each solid waste plan must address the following components:

11. Source reduction is normally practiced at the corporate level to _____ waste from having to be managed at all.

12. Benefits of source reduction include:

13. The waste diversion goal in Kentucky is _____ percent.

14. Recycling is the separation of a given waste material. These may include: _____, _____, _____, and _____.

15. One of the major goals in development of a solid waste management plan is to increase _____.

16. Types of door-to-door collection systems include:

17. _____ is defined as “a municipal solid waste collection system that is established by ordinance, approved by the Cabinet and requires access for each household or solid waste generator in a county.”
18. Three methods for the disposal of municipal solid waste are:
_____, _____, _____.
19. Siting of new landfills is difficult in Kentucky due to:

20. Kentucky currently depends _____ percent on land disposal of its solid waste.
21. _____ activities are essential to effective solid waste management.
22. Sites failing to meet environmental performance standards are called _____.
23. Examples of Environmental Performance Standards include:

24. Landfill operation standards require: _____ control while prohibiting _____.
25. Three major landfill categories that require a permit are:

26. _____ and _____ are no longer recognized as landfill permit categories.

27. In addition to landfills, the Division also issues permits for:
-
-
-
28. The _____ is the person who applies with the state agency for a solid waste site or facility permit.
29. The _____ should be consulted during all phases (construction, operation, and closure) of the site.
30. Solid waste permit applications must be consistent with _____ regulations and zoning ordinances.
31. The landfill operator is responsible for:
-
-
-
32. The landfill manager is responsible for:
-
-
-
33. An interim operator would be hired if the regular landfill operator were going to be off _____ consecutive operating days.
34. _____ and _____ landfills must have at least one (1) certified operator and one (1) certified manager.
35. The certified operator must be _____ at the facility during working hours.

36. You must score at least _____ percent on the operator's test to obtain certification.

37. Your certificate may be revoked if:

CHAPTER 2

LANDFILL PERMITTING GUIDELINES and PROCESS

The following section will guide you through major steps in the permitting process. However, it does not cover all the steps involved in obtaining a permit. To ensure all necessary information is included in the application you will need a set of statutes and regulations. You can obtain a set by contacting the Program Planning and Administration Branch of the Division. A copy of the Regulation Order Form has been included in the Appendix Section of this manual. Landfill permitting laws are found in Kentucky Revised Statutes (KRS) Chapter 224. 401 Kentucky Administrative Regulations (KAR) Chapters 30, 40, 45, 47, 48 and 49 contain specific regulations for each type of solid waste disposal facility.

One of the most commonly asked questions the Division receives is "I have this piece of land and I was thinking about putting a landfill on it. What do I have to do to get a landfill permit?" Well, to answer that question one has to consider which of the following landfills you want to construct.

LANDFILL PERMIT CATEGORIES

A **contained landfill** will cost in the neighborhood of \$750,000 to \$1.2 million for the application. This includes the design engineer's cost (rock borings, soil borings, etc.) and permitting fees. Permit application fees for contained landfills currently run: \$500 NOI, \$10,000 Administrative, \$5,000 Technical and \$800 Construction Phase. A contained landfill will cost in the neighborhood of \$150,000 to \$250,000 per acre to construct the liner system and final cap. This does not include operating costs. Most contained landfill owners charge disposal fees ranging from \$25 to \$30 per ton to recover costs and make a profit.

A **greater than one acre construction/demolition/debris (C/D/D) landfill** will cost approximately \$500,000 to \$1 million for the application, this includes the design engineer's cost and permit application fees. Permit application fees for C/D/D landfills currently run: \$500 NOI, \$5,000 Administrative, \$5,000 Technical and \$500 Construction Phase. It costs approximately \$75,000 per acre to construct a C/D/D landfill liner system and final cap. This does not include operating costs. Most C/D/D landfill owners often charge disposal fees ranging from \$15 to \$20 per ton.

Another category of landfill is a **residual landfill**. This landfill design is based on the type of waste to be put in the landfill. This liner and cap system can

range from simply clearing the ground of vegetation, placing the waste and covering it up with dirt to as complex as a double composite liner system. The wide range of costs associated with this type of landfill is dependent on the waste that will be placed in it. Permit application fees for residual landfills currently run: \$500 NOI, \$2,500 Administrative, \$2,500 Technical and \$500 Construction Phase. Consultant fees range from \$250,000 to \$750,000. Residual landfill owners often charge disposal fees ranging from \$10 to \$15 per ton.

The last major landfill category is a **special waste landfill**. This landfill is commonly used for the disposal of utility waste (fly ash, bottom ash and scrubber sludge). This is a single phase application. Requirements for construction of this type of landfill are similar to residual landfill requirements. The fee to process the permit application is \$5,000. Consultant fees range from \$250,000 to \$500,000. Special waste landfill owners often charge disposal fees ranging from \$5 to \$15 per ton.

THE PERMITTING PROCESS

This section details the history of solid waste management regulations. It also explains the permit application process for contained, construction/demolition/debris, residual and special waste landfills. Also outlines public notice requirements and general conditions applicable to all solid waste sites or facilities.

The Division of Waste Management's developed the solid waste regulations to protect Kentucky's valuable groundwater and surface water resources.

THE APPLICATION PROCESS

Applications for new landfills consist of three phases - the Notice of Intent (NOI), the Administrative Application and the Technical Application. Kentucky Revised Statute (KRS) 224.40-310 and 401 KAR 47:140 Section 12 and 7(1)(a) through (d) describe the opportunities for public participation in the permitting process through oral and written comments and public hearing(s).

Financial assurance must be posted for closure and closure care. Bonding requirements are set forth in KRS 224.40-650 and 401 KAR 48:310 for solid waste facilities and 401 KAR 45:080 for special waste landfills. You will find a copy of all acceptable financial assurance documents in the Appendix of this manual.

The next thing you need to consider is the time it takes to get a construction permit, which allows you to build the landfill of your choice. Most landfill applications average eighteen to 36 months (including the time to correct any

deficiencies with the application as well as hold public hearings that may be requested). It is important to remember that each site is unique. Unforeseen problems may occur that could possibly double the above estimates (a formal hearing adds 12 months).

STEP ONE - LOCAL DETERMINATION

Before you may submit your permit application to the Division of Waste Management for review, you must submit your proposal to the Local Solid Waste governing body of the county in which the site is proposed. This determination ensures that the proposed facility is consistent with the county and/or area plan. The governing body has sixty calendar days from receipt of the written request to make the determination. The requirements for this determination can be found in KRS 224.40-315.

At this point, it is strongly suggested that you schedule a meeting with the Division of Waste Management to discuss the location of the site as well as discuss various other permits necessary for this project, such as KPDES discharge permits, floodplain permit, transportation permit, etc. The Division has a list of agencies and people to contact for these other permits. Division staff is also available to discuss the permitting and public notification process.

STEP TWO - SUBMITTING THE NOTICE OF INTENT APPLICATION

Once you have your local determination (this determination can be either positive or negative) in hand, place the determination with the Notice of Intent Application and submit it to the Division.

NOTE: If the local determination is negative the Division will, in all likelihood, deny the application during this phase.

Requirements for the NOI application can be found in 401 KAR 47:170. Generally, information required for the NOI application is simply a review of published information, such as general groundwater data, a soil boring and rock coring plan, threatened and endangered species data, historic places, archeological sites, etc. Once the Division accepts the application, the applicant is required to publish a notice in the local newspaper with the largest circulation in the area in which the landfill will be located. One of the most common errors found during completeness review of an application, is that an individual with signature authority for the company does not submit it. 401 KAR 47:160 section 6 describes who may submit an application. The Division has thirty working days to review the application after it is accepted. If there are deficiencies with the application,

you will be notified by letter listing all of the deficiencies. Once the deficiency letter is dated and signed, the review clock is stopped until the application is resubmitted with the deficiencies corrected. The review clock is re-started at the point it was stopped (the clock does not restart at thirty working days). An important section of the application is to consider all the variances and/or alternate designs that may be necessary for your project. Siting requirements in 401 KAR 48:050 need to be closely evaluated for all new landfills.

STEP THREE - THE ADMINISTRATIVE APPLICATION

The administrative application is the second phase of the permitting process. This phase contains site specific information for developing the technical design of the landfill. The application will contain information concerning groundwater flow direction, estimates on the amount of soil that is available to construct and operate the landfill, types and sources of waste to be placed in the landfill, and a conceptual design of the landfill cap and liner design. The requirements of the administrative application are found in 401 KAR 47:180. The Division has sixty working days to review the application. As with the first phase, a letter will be sent if any deficiencies are found during the review process and the clock is stopped and restarted accordingly.

Once the Division approves the administrative application, you will be asked to supply two executive summaries. One will be sent to the County Judge Executive, the other is sent to the public library in the county where the landfill will be located when the notice for the administrative application is published.

This public notice will have a thirty day comment period to allow any interested parties an opportunity to comment on the proposed landfill. This comment period will not hold up the review of the technical application once it is received. If requested, a public hearing (as described in 401 KAR 47:140 sections 7 and 12) will be held in the county where the landfill is proposed. This public hearing is better described as a meeting to exchange information concerning the proposed landfill.

If a hearing is held, a court reporter will be present to record the meeting. Copies of the transcript will be available upon request. The only charge for the copy would be the cost to the Division to reproduce it.

STEP FOUR - THE TECHNICAL APPLICATION

The technical application is the last phase of the permitting process. It contains the design of the landfill cap, liner, and groundwater monitoring plan with

any associated support facilities such as ponds, roads, maintenance buildings, etc. 401 KAR 47:190 contains all the requirements for the technical application.

A public notice is required to be published once the Division receives the technical application. This notice states that the technical application has been received by the Division for review. If you have the technical application prepared and ready for submittal at the end of the administrative application, this public notice can be combined with the administrative application public notice. In other words, the notice for the administrative application would read something like this "The administrative application is complete and the technical application has been received for review".

The Division has ninety (90) working days for the review of the technical application. As with the first phase, a letter will be sent if any deficiencies are found during the review process and the tolled periods are the same as in the first phase. When all the deficiencies have been corrected and each phase of the permit application has met all the applicable regulations, the Division will issue a draft construction permit. A final public notice is then published with a thirty day (30) comment period. This notice includes an opportunity to request an adjudicatory (formal) hearing.

It usually takes the Division two weeks to issue the draft permit. During this time, the Division is working out (with the applicant) the conditions of the permit and gathering the administrative record that will be housed in the public library for the duration of the comment period.

Once the comment period expires and no comments or requests for a hearing have been received, the construction permit can be issued. It usually takes the Division two weeks to issue the permit. During this time, each phase of the application is being stamped approved and signed to go along with the permit authorizing construction of the landfill. You will need these plans to construct the landfill correctly.

Hearings requested during the technical comment period: If a hearing is requested during this period it is an adjudicatory hearing. This is an adversarial proceeding in which everyone has a lawyer. This proceeding will add eight to twelve months to the permitting process. The Division cannot issue the construction permit until the issue(s) are resolved.

CONSTRUCTION

So, it is time to build your landfill. The Division will periodically send representatives to the site to verify that construction of the landfill is the same as what is in the approved design.

It is built! Now what? Once the Division receives certification from your consulting engineer that the landfill has been built according to the approved design, the Division has ten days to issue the operating permit provided the financial assurance documents (closure and closure care bonds) are in order and have been accepted by the Division.

TRANSITION PERIOD

If a residential or inert facility elected to close they did so by complying with the requirements specified below (401 KAR 47:080 section 4(4)):

- NOI was filed with the Division by November 8, 1990,
- operator maintains a valid operating permit, including bond, prior to and during closure,
- groundwater monitoring data includes the parameters identified in 401 KAR 48:300 section 11, for the respective facility category,
- operator performs corrective action provided for if required under 401 KAR 48:300, and
- a complete closure plan is filed which addresses the requirements of 401 KAR 47:080 section 5.

Residual landfills are designed and operated for disposal of specific types of waste. In view of this, specific closure designs are not identified in the regulations. The closure design proposed for a residual landfill must assure compliance with the Environmental Performance Standards in 401 KAR 47:030 and address:

- type and amount of waste in the facility,
- mobility and expected migration rates of the waste,
- site location, topography, surrounding land use, and final site use,
- climate of area,
- characteristics of cover material,
- geologic and soil profiles,
- surface and subsurface hydrology,
- corrective action work specified by the Division,

- deed for the property must be altered to include a statement that future disturbance of the site should occur only after checking for gas or leachate migration, and
- maintenance of the site for 2 years following closure in a manner that complies with the Environmental Performance Standards and the plan approved by the Division.

As previously discussed, facilities which elected to remain open past July 1, 1992, had to file by May 8, 1991 a permit modification to outline the type of facility they wished to convert to. In the case of residential landfills, a modification to meet the transition requirements to operate as a garbage landfill July 1, 1995 or convert to >1 acre C/D/D had to be filed. The category of facility selected - contained, construction/demolition/debris, or residual landfill - determines the type of design and operational standards. Identified below are regulations, which outline requirements for each category of facility. The details of each will be discussed in subsequent chapters of the manual.

GENERAL REQUIREMENTS FOR ALL LANDFILL TYPES

- 401 KAR 47:100 General Provisions for Obtaining a Solid Waste Permit
- 401 KAR 47:120 Conditions Applicable to all Solid Waste Permits
- 401 KAR 47:130 Changes to Solid Waste Permits; Expiration of Solid Waste Permits
- 401 KAR 47:160 Application Procedures
- 401 KAR 47:170 Notice of Intent to Apply for a Solid Waste Permit
- 401 KAR 47:180 Contents of the Administrative Application for Solid Waste Landfills
- 401 KAR 47:190 Contents of the Technical Application for Solid Waste Landfills
- 401 KAR 48:050 Siting Requirements for Solid Waste Landfills
- 401 KAR 48:300 Surface and Groundwater Monitoring and Corrective Action
- 401 KAR 48:310 Financial Requirements and Bonds

RESIDUAL LANDFILLS

- 401 KAR 48:170 Technical Requirements for Residual Landfills

>1 ACRE CONSTRUCTION/DEMOLITION/DEBRIS LANDFILLS

- 401 KAR 48:060 Technical Requirements for Construction/Demolition/Debris Landfills

CONTAINED LANDFILLS

- 401 KAR 48:070 Design Requirements for Contained Landfills
- 401 KAR 48:080 Liner and Cap Design Requirements for Contained Landfills
- 401 KAR 48:090 Operating Requirements for Contained Landfills

By July 1, 1992 all solid waste site facilities were required to:

- possess a permit which complies with the standards outlined in 401 KAR chapters 47 and 48 for the specific facility,
- have complied with the requirements specified to allow MSW disposal until July 1, 1995,
- cease to take waste, or
- have an application pending with the Division for one of these options.

PERMITTING AND PUBLIC INFORMATION PROCESS

State law requires that a permit be obtained to establish, construct, operate, or maintain a waste management site or facility. Solid waste regulations provide for a 3 phase application process for solid waste landfills. It also specifies time frames by which the Division must review and take action on each phase. Differing public information requirements also exist for the application phases. The only persons not required to obtain a permit for the disposal of solid waste are:

- return of agricultural wastes to the soils as conditioners,
- disposers of mining overburden, coal mining wastes, refuse, and coal mining by-products returned to the mine on the site of generation,
- owners of injection wells which have an Underground Injection Control Permit,
- users of septic tanks,
- owners of surface impoundments with Kentucky Pollutant Discharge Elimination Permits, and
- persons managing solid wastes during response to a spill of solid waste, imminent and substantial threat of a spill, or spill of material which, when spilled, becomes a solid waste.

The permit application process to construct or significantly expand a solid waste landfill permit consists of 3 phases:

- notice of intent to apply for a solid waste permit,
- administrative application, and
- technical application

LOCAL DETERMINATION

According to KRS 224.40-315, counties which host a landfill have an opportunity to make a determination on permit applications that request any additional volume before the Division of Waste Management accepts an application for review.

Local determination means that a local governing body (as designated in the county's solid waste management plan) reviews a permit application to determine if it is consistent with the county's solid waste management plan. With few exceptions, local determination applies only to the construction or any expansion of a municipal solid waste landfill.

The local governing body has 60 days to take appropriate action from the day it receives the written request from the applicant. The governing body must publish a public notice that a local determination has been requested in order to allow for public comment and/or a public hearing. After the public comment period, the governing body submits a written determination, to the Division on whether the permit application is consistent with the local solid waste management plan. To summarize, these are the steps necessary for local determination:

- Upon receipt of a written request for a local determination, the local governing body must public notice in a newspaper that a local determination has been requested. The public must be allowed input and opportunity for a public hearing. While there is not specific time period set by statute, a "reasonable" amount of time must be allowed for public input.
- Within 60 days (including the public comment period) the local governing body must submit a written determination to the Division. This determination should be based upon the data contained in the solid waste plan and should be specific.
- If the Division approves the permit application after the governing body has determined the application to be inconsistent, the Division will

provide written explanation to the governing body stating the specific reasons why it did not accept the local determination.

NOTICE OF INTENT

Filing a notice of intent with the Division is the initial step in the permitting process and is meant to:

- advise the division of the applicant's intent: permit a new facility or expand an existing site,
- identify the location of the site,
- allow for a general site review, relative to site suitability, based on existing data (i.e., Wild and Scenic Rivers Act, National Historic Preservation Act, etc.), and/or
- allow for a review and approval of plans to conduct field investigations to collect site specific information.

Specific requirements for the notice of intent are found in 401 KAR 47:170. Upon submittal of this application, the Division has 30 working days to complete its review. The 30 working day time frame does not include any time period the Division allows the applicant to make necessary modifications.

All applicants are required to public notice the submittal of a notice of intent. The public notice identifies the name and address of the applicant, gives a brief description of the facility to be permitted, details the location of the site including primary access routes, and the Division of Waste Management's name and address. The notice of intent application form contains a public notice form that the applicant must complete. The Solid Waste Branch will draft the public notice and forward it to the applicant for submittal of publication in a local newspaper. Evidence of publication must be submitted to the Solid Waste Branch thereafter.

ADMINISTRATIVE APPLICATION

Primary objectives of the administrative application are to allow the Division to review potential effects the site could have on human health and environment. The Division must complete its review of this application within 60 working days. 401 KAR 47:180 outlines all information required to be included in an administrative application, which includes:

- ownership information,
- disclosure of background information,
- potential impact on specific facilities, lands, resources, properties, and threatened or endangered species to include:
 - a. geologic and hydrogeologic information,
 - b. results of the geo-technical site investigation,
 - c. topographic map showing buffer zones and waste boundary,
 - d. report describing the proposed siting design and operating requirement restrictions, and
 - e. soils information
- executive summary of the application.

Once the administrative application has been deemed administratively complete and the technical application has been received, the Division:

- issues a special notice, in the form of an executive summary, summarizing the content of the application to the county judge executive in the county in which the site or facility will be located, and
- requires the applicant to provide a public notice which provides a statement that an executive summary is available from the judge executive's office and allows for comments to be submitted or a public hearing requested.

The same procedures for publication of the public notice for the notice of intent apply to this phase of the application.

Whenever a public hearing is requested, a presiding officer is appointed to schedule and conduct the hearing. During this hearing, any person may submit oral or written statements and data. When a hearing of this type is held, the public comment period is automatically extended to the close of the administrative hearing or a later date specified at the hearing.

TECHNICAL APPLICATION

The third and final phase of the application process is the technical application. The purpose of this application is to outline specific technical standards for the facility design. The Division must complete its review of this application within 90 working days. The contents of this application will vary from site to site. Basic requirements are outlined in 47:190, but this information must be supplemented by technical requirements for the specific type of landfill proposed. This information may be found in 401 KAR 48:060 for

construction/demolition/debris landfills, 48:170 for residual landfills, and 48:070 for contained landfills. Basic requirements outlined in 47:190 include:

- engineering plans showing the design and liner requirements of the site,
- narrative describing the design, construction quality control plan, and recordkeeping and reporting systems,
- closure and closure care plans, along with a cost estimate,
- design specifications for the final cap, and
- surface and groundwater monitoring plans.

The Waste Stream and Handling will discuss this information in detail.

Prior to making a decision to issue the permit, a written determination is made by the Cabinet that the application conforms to and is consistent with the area and state solid waste management plan. The applicant is required to issue a public notice for this phase of the application process.

Once the application is deemed technically complete, the Division will make a preliminary decision to issue the new or expanded permit or deny the application. The final decision is public noticed and receipt of comments allowed for a 30 day period. The public notice advertising the Division's preliminary determination must contain a statement that any person aggrieved by the action may file with the Cabinet a petition which outlines the grounds of the objection and demands a hearing pursuant to KRS 224.10-420. After the close of the public comment period and applicable hearings, the Division or the Secretary of the Cabinet may issue a final permit decision if a hearing is held. Once again the procedures for publication of the public notice for the first two phases apply to this phase of the application.

The permit review process, from the date of receipt of the notice of intent, to the date the Cabinet issue a draft permit to construct a solid waste landfill or denies the application, shall not exceed 365 calendar days, unless the Cabinet and applicant agree otherwise. However, the 30-60-90 working day clock takes precedence.

An applicant, who is issued a permit to construct or expand a solid waste landfill, will be issued a permit to operate in the areas included under the construction permit if the following conditions are met:

- a certification is submitted by the applicant from a registered engineer that the liner system and facilities are constructed in accordance with approved plans, and
- an engineer for the Cabinet has inspected the facility and the required financial assurance mechanism for closure has been submitted.

PERMIT MODIFICATION

Once a permit has been issued, the owner must comply with the following conditions, as specified by 401 KAR 47:120, whether or not they are identified within the permit. The owner of operator must:

- comply with all conditions of the permit. Failure to do so is grounds for enforcement action,
- apply for and obtain a new permit to continue operating after the expiration date of the permit and comply with 401 KAR chapters 47 and 48 prior to operating the facility,
- in the event of noncompliance, steps must be taken to minimize releases and adverse impacts on human health and environment,
- properly operate and maintain all facilities,
- furnish information requested by the Cabinet to determine whether cause exists to modify, revoke, or terminate a permit or to determine compliance,
- allow the Cabinet or its authorized representative to enter the facility, have access to and copy records, inspect equipment, and sample and monitor to ascertain compliance,
- properly sign all applications, reports, and information submitted to the Division,
- not operate new or modified facilities until a statement is received by the engineer that the facility has been constructed or modified according to the permit; and the Cabinet has inspected the facility, and issued the permit, and
- submit monitoring reports at the specified permit or regulatory intervals and submit compliance or noncompliance reports no later than 14 days following each date in a specified compliance schedule.

In addition to the above, the owner should be aware that issuance of a permit by the Division does not convey property rights or exclusive privilege. Any permit may be revoked or modified by cause. The permit issued is not transferable to any person without prior approval of the Cabinet.

FINANCIAL ASSURANCE

When a permit application is filed with the Division to construct a solid waste landfill, the applicant is required to submit post closure and closure care plans and a cost estimate for having a third party complete the work.

The estimate provided for closing the facility should be calculated at the point in the active life when the extent and manner of its operation would make closure the most expensive. In addition, the cost estimate should be based on the following:

- design,
- site grading and drainage,
- hauling and placement of each element of the cap,
- final cap grading and drainage,
- re-vegetation of the cap, and
- quality control and construction certification.

This figure will be adjusted for inflation and other factors each year.

A second cost estimate will be provided, in current dollars, of the cost of hiring a third party to conduct each phase of the closure care monitoring and maintenance. This estimate can be calculated by multiplying the annual cost estimate for each phase of closure care by the number of years of closure care required. For contained landfills, the minimum estimate accepted for closure care will be \$10,000 per year using 1990 as the baseline year. As with the closure estimate, the closure care cost estimate should be based on the most expensive costs and must be revised if changes result which increase the cost.

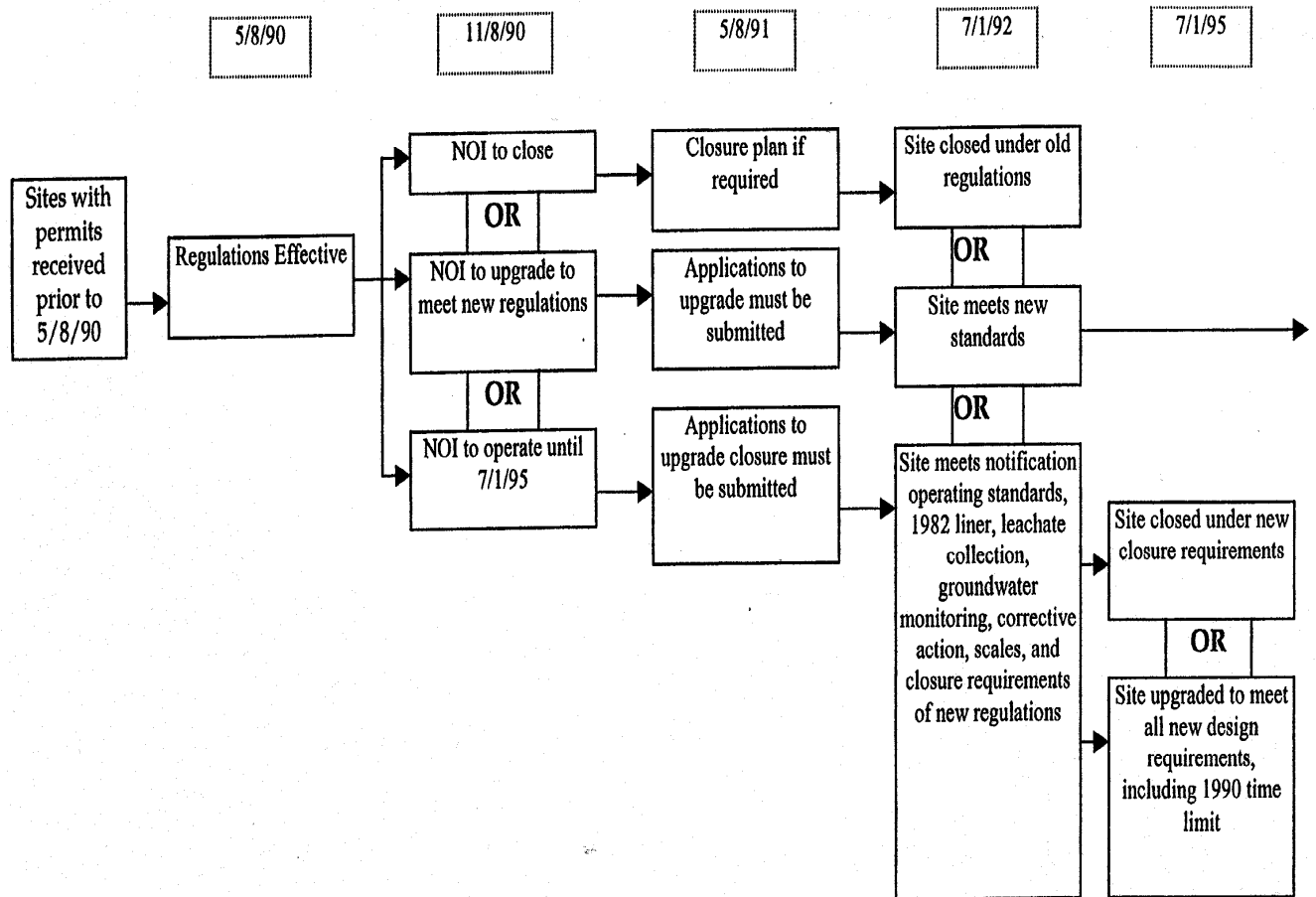
All applicants that obtain a permit for a solid waste site or facility must demonstrate that funds are available to them to meet the costs of closure and post closure care. For the private sector (except for waste sites which are located on property of the generator which accept industrial solid waste from the generator only), this assurance must be accomplished by posting a performance bond and one of the following:

- surety bond,
- letter of credit, or
- escrow agreement.
- trust fund
- closure insurance

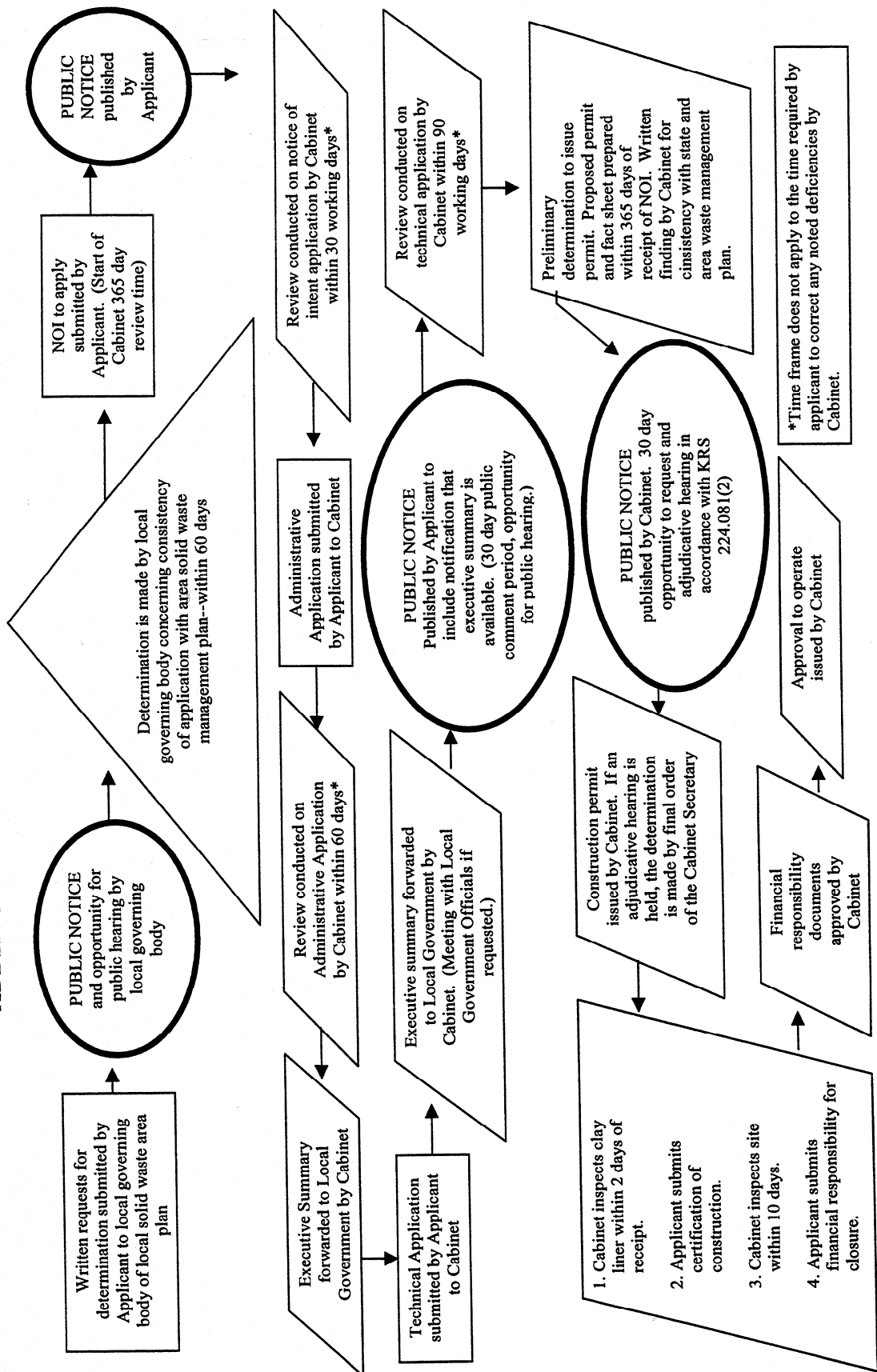
Information on each of these mechanisms may be found in 401 KAR 48:310 along with the wording required for the actual agreements.

Any owner which is a city, county, urban county government, 109 district, taxing district, political subdivision of the Commonwealth, the Commonwealth or any agency thereof, or any entity whose debts and liabilities are those of the above are considered to be a publicly owned facility. Publicly owned facilities are exempt from posting a performance bond by KRS 224.43-610. However, the facility must provide a budget for the permitting, construction, operation, closure, and post closure of the facility. This budget must be revised annually. When any of the elements identified above are to be accomplished by contract or agreement, a copy of these documents must be submitted to the Cabinet.

FIGURE 2-1
TIMING OF ACTIONS DURING THE TRANSITION PERIOD



LANDFILL APPLICATION PROCESS FOR NEW CONTAINED, RESIDUAL, C/D/D AND SUBSTANTIAL ADDITIONAL CAPACITY EXPANSIONS - FIGURE 2-2



STUDY GUIDE
LANDFILL PERMITTING GUIDELINES/
THE PERMITTING PROCESS

1. List four types of landfills you must obtain permits for:

2. Most landfill applications take _____ to _____ months to go through the entire permitting process.

3. What are the five major phases an application must pass through before final approval is given for a landfill to legally accept waste?

4. Why is it important to obtain a Local Determination before submitting an application for a solid waste disposal facility to the Division?

5. The state shall _____ a landfill application for any expansion without a local determination.

6. Contained landfill facilities are subject to ____ year closure care requirements.

7. Permit applications to construct or modify a landfill consist of three phase:

8. List information contained in the Notice of Intent.

9. The Division of Waste Management's final determination on the issuance of a construction permit may not be made until

10. The cabinet will issue a permit to operate a solid waste landfill when:

11. A private landfill must post at least one of the following financial guarantees to ensure proper closure and closure care. This guarantee must be submitted along with the initial application.

CHAPTER 3

WASTE STREAMS AND HANDLING

Solid wastes are classified according to types and properties. This section describes wastes that are acceptable, unacceptable; require special handling, and/or special permission for disposal at different types of landfills. Solid waste is produced from various sources including households, businesses, and farms. Outlined below are examples of wastes produced from each of these sources.

TYPES OF WASTE

People dispose of many different types of waste. Not all landfills are permitted to accept all waste that can be generated by certain households, businesses and industries. Before we discuss which wastes are acceptable at certain landfills, it is important to understand the differences in waste streams. The following types of wastes are generated on a daily basis:

Solid wastes (as defined by KRS 224.01-010): Any garbage, refuse, sludge, and other discarded material, including solid, liquid, semi-solid, or contained gaseous material resulting from industrial, commercial, mining (excluding coal mining wastes, coal mining by-products, refuse and overburden), agricultural operations, and from community activities, but does not include those materials including, but not limited to sand, soil, rock, gravel, or bridge debris extracted as part of a public road construction project funded wholly or in part with state funds, recovered material, special wastes as designated by KRS 224.50-760, solid or dissolved material in domestic sewage, manure, crops, crop residue, or a combination thereof which are placed on the soil for return to the soil as fertilizers or soil conditioners, or solid or dissolved material in irrigation return flows or industrial discharges which are point sources subject to permits under section 402 of the Federal Pollution Control Act, as defined by the Atomic Energy Act of 1954, as amended (68 stat. 923).

MUNICIPAL SOLID WASTE

RESIDENTIAL

Residential waste consists of both putrescible and non-putrescible waste generated by households. Household Solid Waste: Solid waste, including garbage and trash generated by single and multiple family residences, hotels, motels, bunkhouses, ranger stations, crew quarters, and recreational areas such as picnic

areas, parks, and campgrounds. The average density of this waste is 500 to 1,000 lbs. per cubic yard as it enters the landfill. This type of waste must be disposed of at a contained landfill and will contain:

- food wastes, which are putrescible (decay or rots quickly). These wastes attract flies and rats and can cause odors,
- paper and packaging,
- hazardous waste such as paint thinners, drain cleaner, pesticides, etc., generated by households, (batteries must go to a recycler)
- bulky items (furniture appliances, white goods), and other bulky items that can be difficult to handle and compact.
- must be disposed of in contained landfills, and
- average density is 500 to 1000 lb./cubic yard as it enters the landfill,

COMMERCIAL

All types of solid waste generated by stores, offices, restaurants, warehouses, and other service and non-manufacturing activities, excluding household and industrial waste. Examples include: food, paper, cardboard, plastics, textiles, leather, yard wastes, wood, glass, tin cans, aluminum, ashes, leaves, tires, white goods, furniture, household hazardous waste, etc. This waste is primarily disposed of at a contained landfill. It is difficult to get a good compaction rate for this waste and it is slow to decompose. The average density is 200 to 700 lbs. per cubic yard. This waste may contain:

- contains a large amount of paper and packing materials (i.e., paper, plastic, cans, etc.) and some wood which are combustible and have the potential to catch on fire,
- slow to decompose,
- difficult to get good compaction, and
- primarily disposed of at contained landfills but some non-putrescible wastes may go to construction/demolition/debris landfills
- average density is 200 to 700 lb./cubic yard,

INSTITUTIONAL

Institutional wastes are wastes generated by schools and hospitals. This waste must be disposed of in contained landfills. This waste contains:

- large amounts of both food wastes and paper/packaging wastes,
- regulated hazardous wastes such as laboratory chemicals,

- needles, bandages, body parts, bedding, etc., and
- infectious wastes, which are not classified as hazardous wastes.

Medical (Biohazard/Infectious) Waste: Wastes resulting from the operation of hospitals, and nursing homes, and may cause disease or reasonably be suspected of harboring pathogenic organisms. Examples include: diseased human parts, contaminated bandages, pathological specimens, hypodermic needles, contaminated clothing, surgical gloves, etc.

- Hospitals and nursing homes generate medical wastes such as needles, bandages, body parts, bedding, etc., and
- Infectious wastes not classified as hazardous wastes and may be disposed of in contained landfills.

CONSTRUCTION/DEMOLITION/DEBRIS

C/D/D Wastes: Solid waste which results from the construction, remodeling, repair, and demolition of structures and roads. This waste consists primarily of building materials and rubble, is relatively inert with the exception of wood and does not compact well (it ranges widely). Examples include: bricks, concrete and other masonry materials, wood, rock, uncontaminated soil, wall coverings, drywall, plumbing fixtures, metals, furniture, shingles, insulation, etc. Asbestos from these buildings may only be disposed of in a contained landfill

- consist of waste building materials and rubble,
- relatively inert with the exception of wood, and
- primarily disposed of in construction/demolition/debris landfills.

SPECIAL WASTE

Special wastes (as defined in KRS 224.50-760): Those wastes of high volume and low hazard. Examples include: mining wastes, utility wastes (fly ash, bottom ash, scrubber sludge), sludge from waste and wastewater treatment facilities, cement kiln dust, gas and oil drilling muds, oil production brines, etc. Any waste not listed in the law may only be considered special waste if the generator files and Cabinet approves a petition stating that the characteristics are present:

- Waste exhibits the characteristic of high volume as determined by:
 - a. Non-liquid wastes that are generated at an average annual rate of greater than 49,614 tons or 45,000 metric tons per year per Kentucky facility.
 - b. Liquid wastes that are generated at an average annual rate of more than 1,000,000 metric tons per year per Kentucky facility.
- Waste exhibits the characteristic of low hazard if:
 - a. There is a low probability that the management, processing, or disposal of the waste would violate the provisions of 401 KAR 30:031.
 - b. The waste is not a hazardous waste as defined in 401 KAR chapter 31.
 - c. The waste is not mixed with, co-disposed or co-treated with solid waste or hazardous waste.

Sewage Treatment Plant Residues: The sewage treatment process generates sewage treatment plant residues. These residues:

- contain coarse screenings and de-watered sludge,
- require an additional waste stream approval from the landfill operator prior to disposal,
- may present a fire hazard in large accumulations.

NOTE: Septic tank pumpings cannot be accepted at solid waste landfills without the addition of bulking agents, which will ensure that they pass the paint filter test. This is due to the large amount of free liquids this waste contains.

WASTE TIRES

Waste tires generated by households, dealers, junkyards, and other businesses other than tire-manufacturing industries are considered both municipal solid wastes and waste tires under the law.

PETROLEUM CONTAMINATED SOIL

Petroleum contaminated soil is considered a municipal solid waste unless it is the by-product of a manufacturing process.

INDUSTRIAL/RESIDUAL SOLID WASTE

Solid waste generated by manufacturing or industrial processes that is not a hazardous waste or a special waste. Examples include: waste from fertilizer or agricultural chemical manufacturing, wastes from plastics and resin manufacturing, waste from the pulp and paper industry, water treatment sludge, waste from air pollution control devices, etc. This term does not include residential like wastes that come from offices, lunchrooms and packaging (unless packaging is what is being made at a particular facility). Industrial waste should be disposed of in a contained or residual landfill. Some examples of industrial wastes are:

- sludges (paint waste, water treatment),
- dusts (air pollution control),
- cuttings, grindings, stampings, product rejects, and
- contaminated soils if they result from an industrial process.
- large amounts of paper/packaging wastes, and
- may contain regulated small quantity hazardous wastes such as laboratory chemicals, if disposed in a contained landfill.

FARMING/AGRICULTURAL WASTES

Agricultural wastes are non-hazardous wastes generated from the production and processing of on the farm agricultural products. Similar wastes produced by racetracks, tree services, or other businesses are not considered agricultural waste.

MANURE AND CROP RESIDUES

Manure and crop residues are exempt from the definition of solid waste when returned to the soil as fertilizer or soil conditioners in practices common for this use.

HERBICIDES AND PESTICIDES

Herbicides and pesticides are not classified as agricultural wastes. Empty containers must be triple rinsed before they may be disposed of at a solid waste landfill. Furthermore:

- pesticides residues are not regulated hazardous wastes when disposed of in accordance with label instructions, and
- only a farmer disposing of pesticide residues from his own use is exempt.

HAZARDOUS WASTE

Hazardous Wastes (as defined in KRS 224.01-010): Any discarded material or material intended to be discarded or substance or combination of such substances intended to be discarded, in any form, which because of its quantity, concentration, or physical, chemical or infectious characteristics may cause, or significantly contribute to an increase in mortality or an increase in serious irreversible, or incapacitating reversible illness or pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported, disposed or, or otherwise managed. Examples include: paint wastes, discarded chemicals, discarded pesticides, spent solvents, incinerator ash, electroplating wastes, etc. (see 401 KAR 31:030 and 401 KAR 31:040). Manufacturing facilities, small businesses, and institutions such as hospitals, schools and universities typically generate hazardous wastes. A waste is classified as a hazardous waste if it is listed or testing shows, it meets the characteristic of a hazardous waste. The regulations related to hazardous waste determinations can be found in 401 KAR chapter 31.

- Listed wastes include wastes generated by nonspecific industrial operations such as degreasing solvents, other spent solvents, electroplating operations, and specific sources such as petroleum refiners, wood preservers, etc.
- Discarded commercial products, off specification chemicals, container residues and spill cleanup residues may also be listed hazardous waste
- Some of the wastes described in the preceding paragraph are considered to be “acutely toxic” and become regulated when as little as one quart is generated
- Hazardous waste characteristics in general terms are as follows:
 - a. Ignitable wastes are liquids with a flash point below 140°F
 - b. Corrosive wastes are aqueous liquids with a pH below 2.0 and greater than 12.5
 - c. Reactive wastes are unstable under normal conditions and can explode or react violently with water to explode or produce toxic gases.
 - d. Toxic wastes can leach designated contaminants when subject to the toxicity characteristic leaching procedure (TCLP) test. This test is designed to simulate landfill conditions.

Limited Quantity Generators: Persons who generate less than 220 pounds of hazardous waste in any one-month are conditionally exempt small quantity generators. Hazardous wastes from this type of facility are exempt from hazardous waste regulations. Therefore, they are acceptable for disposal at some contained landfills. Small quantity (220 to 2,200 pounds) and large quantity (over 2,200 pounds) generators either must handle hazardous waste onsite or ship wastes to a permitted hazardous waste treatment, storage, disposal, or recycling facility.

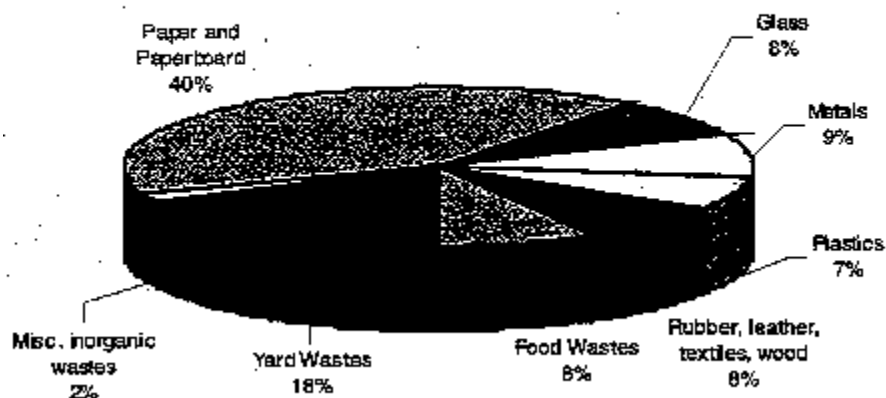
- Do not accept any waste accompanied by a hazardous waste manifest.
- Division of Waste Management field office must be notified immediately when actual or suspected hazardous waste is found during random inspections or during unloading.

Random inspections are an important method to detect these wastes and prevent their disposal at a solid waste landfill.

WASTE COMPOSITION

The composition of waste varies widely between household, commercial and industrial discards. For an average community in the United States, waste composition is 18.5 percent organic (glass, metal) and 81.5 percent organic (paper, plastics, rubber, leather, textiles, wood, food, and yard waste). The U.S. Environmental Protection Agency quotes these estimates.

FIGURE 3-1



Seasonal variations in waste composition affect the amount of waste generated. An example of a seasonal variation is yard wastes, which are a major component of residential waste in the summer months but practically non-existent in the winter.

Recycling can also have an important impact on the waste stream. As certain materials are recovered (such as newspaper, cardboard, and aluminum) the amount and composition of waste changes. Waste composition is also subject to change as one type of material displaces another and/or consumer buying habits change (e.g. plastic bottles or aluminum instead of glass).

WASTE STREAMS ACCEPTABLE FOR DISPOSAL AT SOLID WASTE LANDFILLS

The landfill-operating permit identifies the types and geographic source(s) (county/state of waste origination) of wastes a landfill is approved to receive. Once the permit is issued, any waste described from any geographical source, listed on the permit, may be accepted without further written approval.

HOUSEHOLD HAZARDOUS WASTE

Household hazardous wastes are leftover or unwanted commercial products used in the home. They have the same hazardous properties as regulated industrial hazardous wastes but are not regulated when generated by households. This means they can ignite or catch fire; react or explode when mixed with other substances; irritate or burn skin; or they are toxic and can adversely affect human health. Household hazardous wastes have the potential to pollute the air and water when disposed of in any landfill other than a contained landfill or flushed down the drain.

Examples include:

- paints,
- pesticides,
- herbicides,
- solvents, and
- caustics, etc.

WASTES REQUIRING SPECIFIC WRITTEN APPROVAL

For contained landfills, any non-residential like waste (waste that does not originate from a household) stream must be approved at the landfill before disposal. The waste must first be characterized and a TCLP or paint filter test conducted. Appendix A contains a copy of the Division's additional waste stream application form.

ASBESTOS

Asbestos wastes can be generated from manufacturing, fabricating, demolition, renovation and spraying operations. Any exposure to airborne asbestos particles for even a short amount of time increases the risk for an adverse health impact. The Division of Air Quality regulates the removal and handling of asbestos before disposal. Outlined below are the regulatory requirements relative to treatment and disposal of asbestos containing material (ACM).

- ACM must be wetted down, placed in two 6 mil. plastic bags and sealed in rigid containers before transporting to the landfill. Either fiber or metal drums are acceptable.
- When ACM wastes are not transported in sealed, rigid containers the transported must have a written waiver from the Division of Air Quality. Bags of ACM waste should not be accepted without a written waiver.
- Drums and bags must be marked with a caution label.
- Do not allow trucks containing ruptured bags to unload.
- Drums must be handled and disposed of in a manner that prevents breaking open containers during unloading and covering.
- The location and placement of ACM should be clearly identified in facility records. These records should document the X, Y and Z coordinates (horizontal, vertical and depth) of the ACM waste.

SLUDGES

Sludges are defined as solids, semi-solids or dusts generated by wastewater treatment units and air pollution control devices. In order to be disposed of in a landfill, sludge cannot contain any free liquids and be hazardous. It may be necessary to perform a TCLP and paint filter test to determine suitability for landfill disposal.

LIMITED QUANTITY GENERATOR HAZARDOUS WASTE

Persons who generate less than 220 pounds of hazardous waste per month are limited quantity generators. These wastes may be disposed of in contained landfills provided:

- the waste passes the paint filter test,
- limited quantity hazardous wastes are listed as a waste type in the permit,
- the facility generating the wastes is listed in the permit, and

- The location and placement of LQGHW should be clearly identified in facility records. These should document the X, Y, Z coordinates of the LQGHW wastes.

CONTAMINATED SOILS

During the clean up of spills and releases, contaminated soils and other debris may be generated. One of the most common sources of this waste is soil generated during the removal of underground storage tanks. The following guidelines should be adhered to when receiving these wastes:

- **do not accept any** contaminated soils unless you know the source of contamination and the soil has been analyzed (TCLP) to demonstrate it is not a regulated hazardous waste,
- PCB spills of oils containing less than 50 ppm PCB may be disposed of at a contained landfill,
- petroleum contaminated soils generated during the removal of underground storage tanks are not a hazardous waste; however, other gasoline contaminated soils must be tested for a hazardous waste determination, and
- petroleum contaminated soils may be used for daily cover if the maximum benzene concentration is equal to or less than 1.0 ppm and if the material is not placed during a precipitation event.

See appendix A for additional wastes that require a permit modification.

WASTES UNACCEPTABLE FOR DISPOSAL AT SOLID WASTE LANDFILLS

UNPERMITTED GEOGRAPHIC SOURCE

Any waste from a city, county or other geographic source not specifically listed in the permit cannot be accepted. An add/delete waste source application must be filed with and approval received from the Division before acceptance at a landfill.

HAZARDOUS WASTE

Manufacturing facilities, small businesses and institutions such as hospitals, schools and universities typically generate hazardous wastes. A waste is classified as a hazardous waste if it is listed or testing shows, it meets the characteristic of a hazardous waste and exceeds the small quantity limit of 2.2 or 220 lbs/mo.

Regulations related to hazardous waste determinations can be found in 401 KAR chapter 31.

- listed wastes include wastes generated by nonspecific industrial operations such as degreasing solvents, other spent solvents, electroplating operations, and specific sources such as petroleum refiners, wood preservers, etc.
- discarded commercial chemical products, off specification chemicals, container residues and spill cleanup residues may also be listed hazardous waste
- some of the wastes described in the preceding paragraph are considered to be "acutely toxic" and become regulated when as little as one quart is generated
- hazardous waste characteristics in general terms are as follows:
 1. ignitable wastes are liquids with a flash point below 140°F.
 2. corrosive wastes are aqueous liquids with a pH below 2 and greater than 12.5
 3. reactive wastes are unstable under normal conditions and can explode or react violently with water to explode or produce toxic gases.
 4. toxic wastes can leach designated contaminants when subject to the toxicity characteristic leaching procedure (TCLP), a test designed to simulate landfill conditions.

Persons who generate more than 220 pounds of hazardous waste in any one-month are regulated hazardous waste generators. Small quantity (between 220 to 2200 pounds) and large quantity (over 2200 pounds) generators must handle hazardous waste onsite or ship wastes to a permitted hazardous treatment, storage, disposal or recycling facility.

Be aware of the following:

- do not accept any waste accompanied by a hazardous waste manifest,
- Division of Waste Management field office must be notified immediately when actual or suspected hazardous waste is found during random inspections or during unloading, and
- random inspections are an important method to detect these wastes and prevent their disposal at a solid waste landfill.

LIQUIDS/OILS

- Liquids and oils contribute to the generation of leachate and may contain hazardous constituents that are a threat to groundwater and surface water.
- Wastes must pass the paint filter test before they are disposed of in a landfill.
- Some liquids may contain vapors, which can easily ignite.
- Unused paint can be recycled by giving it away.
- Some liquids can irritate the skin or cause burns.

Recycle used oil by taking them to a registered location. Contact the Division for a list.

LEAD ACID BATTERIES

- Batteries contain a strong acid that could cause serious burns to the skin if operators came in contact with the liquid. They also contain high levels of lead, which can contaminate surface water or groundwater.
- Lead acid batteries become a hazardous waste when the case is broken.
- Lead acid batteries can be recycled and can only be accepted by a retail or wholesale seller of new lead acid batteries, a lead smelter, a recycler or collection facility delivering to a smelter or recycler.

WHOLE TIRES

Effective July 15, 1992, KRS 224.50-820 required tires to be processed to prevent the entrapment of air or water before disposal in a landfill. Large off the road tires, such as the tires like the ones used on construction and mining equipment, may be placed in the bottom of a landfill cell or mining pit whole if the criteria specified in the "Notice to All Contained Landfill Owners and Waste Tire Facility Registrants Disposal Of Large Off-the-Road (OTR) Tires" dated December 15, 1999 (enclosed in appendix section) is met.

WHAT WASTES CAN YOU TAKE IN YOUR LANDFILL?

The operating permit for a contained or C/D/D landfill identifies the types and geographic source(s) of wastes the landfill is approved to receive. Once the permit is issued, the appropriate waste from any geographic source may be accepted without further written approval.

CONTAINED LANDFILL - 401 KAR 47:080 Section 2(1) lists common acceptable waste streams for contained landfills. **Acceptable waste streams include the following:**

- All **non-hazardous solid wastes** including household, commercial, institutional, industrial, municipal and C/D/D waste.
- **Properly processed tires:** shredded, quartered, or equivalent.
- **Household hazardous wastes:** leftover or unwanted commercial products used in the home that have the same hazardous properties as regulated industrial hazardous wastes. This means they can ignite or catch fire; react or explode when mixed with other substances; irritate or burn skin; or, they are toxic and can adversely affect human health. The wastes:
 - ✓ can include paints, pesticides and herbicides, solvents, caustics, etc.,
 - ✓ are not regulated as hazardous waste when generated by households,
 - ✓ have the potential to pollute air and water when disposed improperly, and
 - ✓ may be disposed of in contained landfills or recycled.
- **Asbestos containing waste:** Asbestos-containing wastes can be generated from manufacturing, fabricating, demolition, renovation, and spraying operations. Any exposure to airborne asbestos particles for even a short amount of time increases the risk of adverse health effects. The Division regulates the removal and handling of asbestos, before disposal, for Air Quality. Outlined below are the regulatory requirements relative to the treatment and disposal of asbestos containing material (ACM).
 - ✓ must obtain specific written approval by the Cabinet to accept,
 - ✓ should accept early in the day so that ACM will be at the bottom of the lift or dig hole in waste and bury,
 - ✓ must be wetted down, placed in 2 (6 mil.) plastic bags and sealed in rigid containers before transporting to the landfill. Either fiber or metal drums are acceptable,
 - ✓ when ACM wastes are not transported in sealed rigid containers, the transporter must have a written waiver from the Division for Air Quality; bags of ACM waste should not be accepted without a written waiver,
 - ✓ drums and bags must be marked with a caution label,
 - ✓ do not allow trucks containing ruptured bags to unload, and drums must be handled and disposed of in a manner that prevents breaking open containers during unloading and covering

- **Sludges:** defined as solids, semi-solids or dusts generated by wastewater treatment units and air pollution control devices.
 - ✓ must obtain specific written approval by the Cabinet to accept,
 - ✓ testing is necessary to verify a sludge is not a hazardous waste (TCLP),
 - ✓ must be dry or pass the paint filter test (method of testing for free liquids), and
 - ✓ may be treated before disposal at the landfill to remove free liquids (belt press, drying beds, etc.).

Conditionally Exempt Small Quantity Generator Hazardous Waste: people who generate less than 220 pounds of hazardous waste per month are conditionally exempt small quantity hazardous waste generators. These wastes may be disposed of in contained landfills provided that the owner or operator:

- ✓ obtains specific approval by the Cabinet, and
 - ✓ ensures that the waste passes the paint filter test.
- **Contaminated Soils:** During the clean up of spills and released, contaminated soil and other debris may be generated. One of the most common sources of this waste is soil generated during the removal of underground storage tanks.
 - ✓ **Do not** accept any contaminated soils unless you know the source of contamination and the soil has been analyzed to demonstrate it is not a regulated hazardous waste.
 - ✓ PCB spills of oils containing less than 50 ppm PCB may be disposed of at a contained landfill.
 - ✓ Petroleum contaminated soils, generated during the removal of underground storage tanks, are not a hazardous waste; however, other gasoline-contaminated soils must be tested for hazardous waste determination.
 - ✓ Contaminated soil can be used as daily cover only if benzene concentration is less than 1 ppm and material is not applied during a precipitation event.
- **Tire Chips used for liner and drainage layer protection.** Please see the "NOTICE TO ALL CONTAINED SOLID WASTE LANDFILLS-effective November 17, 2000, for all the specifics. You will find it in the Appendix Section of this manual.
- **Any other wastes listed as acceptable in the landfill permit**

CONSTRUCTION/DEMOLITION/DEBRIS (C/D/D) LANDFILL

401 KAR 47:080 section 2(2) lists common acceptable and unacceptable waste streams. Acceptable wastes include the following:

- Any solid waste, which results from the construction, remodeling, demolition or repair of structures and roads.
- Uncontaminated solid waste consisting of vegetation resulting from land clearing and grubbing, utility line maintenance, and seasonal storm related clean up. Such wastes include, but are not limited to:
 - a. bricks, concrete and other masonry material
 - b. shredded or segmented tires
 - c. clean soil and rock
 - d. wood
 - e. wall coverings
 - f. plaster and drywall
 - g. plumbing fixtures
 - h. tree stumps, limbs, leaves and yard waste
 - i. sawdust
 - j. paper and paper products
 - k. metals
 - l. furniture
 - m. insulation
 - n. roofing shingles
 - o. asphaltic pavement
 - p. glass
 - q. plastics that are not sealed in a manner that conceals other waste
 - r. electrical wiring
 - s. components containing no liquids or hazardous metals that are incidental to any of the above materials
 - t. any other inert waste as approved by the Cabinet

Unacceptable Waste:

- a. waste from an unpermitted geographic source
- b. waste not listed on the permit
- c. waste that does not result from construction, demolition, remodeling or repair of structures or roads
- d. electrical fixtures containing hazardous liquids such as fluorescent light ballasts or transformers

- e. PCB containing waste
- f. hazardous material spill residues
- g. conditionally exempt small quantity generator waste
- h. any hazardous waste regulated by 401 KAR chapters 31 and 32
- i. whole tires
- j. liquids
- k. drums
- l. fuel tanks

RESIDUAL LANDFILLS

There are no detailed acceptable waste streams for residual landfills listed in the regulations. A residual landfill can only dispose of the waste streams listed on their permit. A TCLP analysis of all waste streams is required before disposal. In general, the following waste streams are not acceptable at residual landfills:

- hazardous waste
- municipal solid waste
- free liquids

SPECIAL WASTE LANDFILLS

An owner or operator may dispose only special waste in a special waste landfill. These wastes include utility coal combustion ash, air or water treatment sludges, and certain oil field wastes. As with residual landfills, there are no detailed acceptable waste streams for special waste landfills listed in the regulations. As long as the waste stream is listed as acceptable on the permit, it can be disposed of in a special waste landfill.

In general, the following waste streams are **not acceptable** at special waste landfills:

- hazardous waste
- municipal solid waste
- industrial solid wastes

SPECIAL HANDLING CONSIDERATIONS FOR SPECIFIC TYPES OF WASTE

The following is an overview of how certain waste streams must be handled.

ASBESTOS

- Cover immediately with 2 to 4 feet of compacted garbage.
- When covering asbestos, a sufficient cushion of garbage must be maintained between the equipment and asbestos to prevent releases to the air.
- Landfill employees must comply with OSHA standards when handling asbestos wastes.
- Other landfill users should not be allowed in an area where asbestos is being handled.
- Must be transported in approved containers (a truck is not a container) and exceptions require written approval from the Division for Air Quality.
- Containers or bags must not be ruptured during handling and compaction.
- If required by the permit, asbestos must be buried in a separate area.

SLUDGES

- Must be placed in the working face and co-mixed with refuse unless an alternate method is specified in permit,
- cannot be used for daily cover, and
- can only be applied to cover soil to aid in re-vegetation if approved by permit.

BULKY ITEMS

- Can lend to uneven settlement which prevents adequate runoff,
- crushing, compacting or shredding on solid ground before pushing into the working face is recommended,
- place in bottom of cell or separate area,
- objects placed in the initial lift must not be allowed to damage the bottom liner (401 KAR 48:090 section 9),
- materials for salvage or recycling may only be accumulated if a separate area away from the working face has been designated in the permit (401 KAR 48:090 section 9), and
- a chipper can be used to significantly reduce the volume of brush and the potential settlement.

SMOLDERING WASTE

- empty load away from working face in the area designated in the permit (401 KAR 48:090 section 5),
- water down only as much as needed to completely extinguish as additional liquids will contribute to leachate,
- place in working face, compact and cover when no risk of fire remains, and
- exposed glass wastes have been known to start landfill fires on sunny days and should be covered with waste or soil promptly.

DUSTS

- Containerization or wetting is strongly recommended to prevent a hazard to exposed persons.

DRUMS

- may conceal hazardous waste or waste with free liquids,
- poor compaction may lead to uneven settlement and voids in the landfill
- must be open for inspection to ensure regulated hazardous waste or free liquids are not contained within
- sealed drums must not be opened or accepted for disposal by landfill personnel
- sealed drums may contain explosive vapors, regulated hazardous waste(s), or free liquids and
- return sealed drums to sender

WASTE STREAM TESTING

Before you dispose of certain wastes at your landfill, it is important to find out if you can accept those wastes at your landfill. By conducting a visual inspection of the waste, you cannot always determine if that waste is acceptable. Sometimes laboratory analyses are required to determine if a waste contains leachable material or if a waste is too wet. The two tests most commonly run on waste streams are the TCLP (toxicity characteristic leaching procedure) and the Paint Filter Test.

When a TCLP test is conducted, the waste stream is tested in a manner that reproduces the acidic environment of a landfill. The purpose of the test is to see

how much of a particular constituent will leach out of the waste and potentially pollute the groundwater.

The paint filter test determines if a material contains free liquids. If a waste stream contains free liquids, it cannot be disposed of at a landfill. The waste must be processed or mixed with solids until it can pass the paint filter test before disposal is allowed.

METHOD 9095 - PAINT FILTER LIQUIDS TEST

1.0 SCOPE AND APPLICATION

- 1.1 This method is used to determine the presence of free liquids in a representative sample of waste.
- 1.2 The method is used to determine compliance with 40 CFR 264.314 and 265.314.

2.0 SUMMARY OF METHOD

- 2.1 A predetermined amount of material is placed in a paint filter. If any portion of the material passes through and drops from the filter within the five-minute test period, the material is deemed to contain free liquids.

3.0 INTERFERENCES

- 3.1 Filter media were observed to separate from the filter cone on exposure to alkaline materials. This development causes no problem if the sample is not disturbed.

4.0 APPARATUS AND MATERIALS

- 4.1 Conical paint filter: Mesh number 60 (fine meshed size) - available at local paint stores such as Sherwin Williams and Glidden for an approximate cost \$0.07 each.
- 4.2 Glass funnel: If the paint filter with the waste cannot sustain its weight on the ring stand, then a fluted glass funnel or glass funnel with a mouth large enough to allow at least one inch of the filter mesh to protrude should be used to support the filter. The funnel is to be fluted or have a large open mouth in order to support the paint filter yet not interfere with the movement to the graduated cylinder of the liquid that passes through the filter mesh.

- 4.3 Ring stand and ring or tripod.
- 4.4 Graduated cylinder or beaker: 100 ml.

5.0 REAGENTS

- 5.1 None

6.0 SAMPLE COLLECTION, PRESERVATION AND HANDLING

- 6.1 All samples must be collected according to the directions in the monitoring your landfill chapter of this manual.
- 6.2 A 100 ml. or 100 gram representative sample is required for the test. If it is not possible to obtain a sample of 100 ml. or 100 gram that is sufficiently representative of the waste, the analyst may use larger size samples in the multiples of 100 ml. or 100 gram (i.e., 200, 300, 400 ml. or gram). However, when larger samples are used, the analysts shall divide the sample into 100 ml. or 100 gram portions and test each portion separately. If any portion contains free liquids, the entire sample is considered to have free liquids.

7.0 PROCEDURE

- 7.1 Assemble test apparatus as shown in Figure 1.
- 7.2 Place sample in the filter. A funnel may be used to provide support for the paint filter.
- 7.3 Allow sample to drain for 5 minutes into the graduated cylinder.
- 7.4 If any portion of the test material collects in the graduated cylinder in the 5 minute period, the material is deemed to contain free liquids for purposes of 40 CFR 264.314 and 265.314.

8.0 QUALITY CONTROL

- 8.1 Duplicate samples should be analyzed on a routine basis.

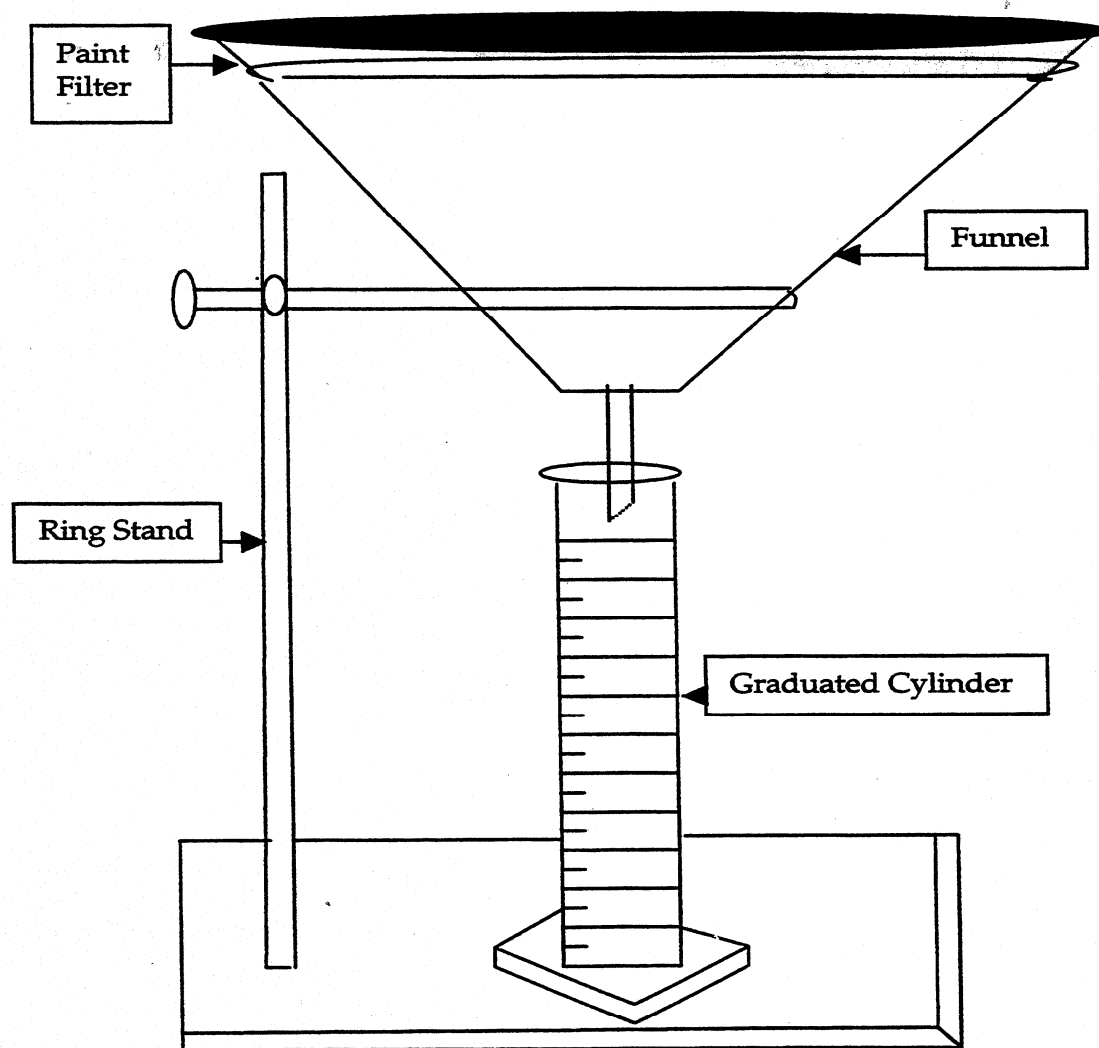
9.0 METHOD PERFORMANCE

- 9.1 No data provided.

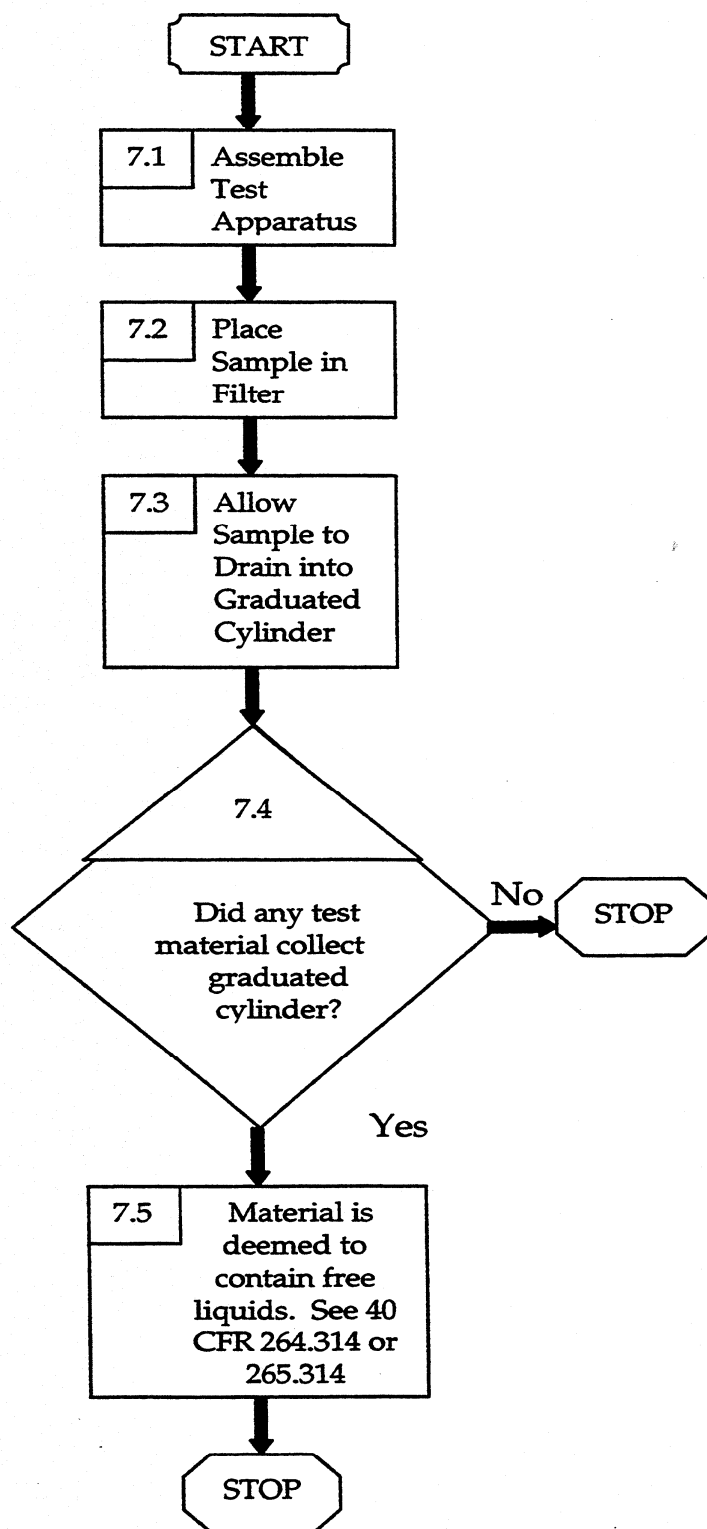
10.0 REFERENCES

- 10.1 None Required.

FIGURE 1 – PAINT FILTER TEST APPARATUS



METHOD 9095
PAINT FILTER LIQUIDS TEST



STUDY GUIDE

WASTE STREAMS/WASTE HANDLING

1. Name four characteristics of municipal wastes that necessitate proper handling and disposal.

2. Putrescible wastes will _____ or _____.

3. _____ waste is generated by households.

4. _____ waste is generated by stores, offices, and non-manufacturing businesses.

5. _____ waste is generated by schools and hospitals.

6. _____ waste is generated as a result of building, remodeling, repairing, and demolishing buildings and other structures.

7. Non-hazardous liquids may be disposed of at a contained landfill.

TRUE or FALSE

8. No further testing is required for sludges once they have passed the paint filter test and have been approved for disposal. **True or False** Why?

9. Whole tires generated by households may be placed in the working face. **True or False**

10. What is the most significant seasonal waste stream and what percent of the total waste stream does it usually represent?

11. Household hazardous wastes are acceptable for disposal at solid waste landfills even though they have the same hazardous properties as regulated industrial hazardous waste. List some examples of household hazardous waste.

12. What are the most important handling considerations when receiving and disposing of asbestos waste?

13. Sludges disposed of in a landfill cannot contain any _____ and cannot be a _____ material.

14. Materials containing more than _____ ppm PCBs cannot be disposed of in a contained landfill.

15. Contaminated soils must be analyzed using the _____ test. This test proves that the soil is not a hazardous waste.

16. Petroleum contaminated soils, containing equal to or less than _____ ppm benzene, may be used for daily cover, if the material is not placed during a precipitation event.

17. List the five specific conditions and/or waste types that are unacceptable for disposal at a solid waste landfill.

18. The four characteristics of a hazardous material are:

19. Asbestos containing materials must be covered immediately with _____ to _____ feet of compacted waste.

20. Landfill employees must comply with _____ standards when handling asbestos waste

21. Sludges must be placed in the _____ and co-mixed with refuse unless an alternative method is specified in the permit.

22. Sludge can be used as daily cover. **True – False**

23. _____, _____, or _____ bulky items is recommended before placement in the landfill.

24. If you receive or find smoldering or burning waste, you should:

25. Dust should be _____ or _____ to prevent a hazard to exposed persons.

26. _____ wastes are generated by a manufacturing or industrial process that is not a hazardous waste or a special waste.

27. _____ wastes are wastes of high volume and low hazard and include:

28. _____ wastes result from the operation of medical clinics, hospitals and other similar facilities.
29. A waste is classified as hazardous if it is _____ or _____ shows it meets the characteristic of a hazardous waste.
30. Conditionally Exempt Small Quantity Generator Hazardous Waste may be disposed of in a contained landfill if _____ and _____.
31. _____ and _____ are not acceptable at special waste landfills.
32. The two tests most commonly run on waste streams are the _____ and _____.
33. The _____ is used to determine if a material contains free liquids.

CHAPTER 4

THE LANDFILL

This section describes performance standards that landfills must meet including the basic methods of operation, landfill development considerations, and regulatory requirements relative to the siting and design of a landfill.

A landfill is a solid or special waste disposal facility that is designed, operated, and closed in a manner, which complies with the Environmental Performance Standards. The Environmental Performance Standards (EPS), outlined in 401 KAR 47:030 for solid waste sites and 401 KAR 31:031 for special waste facilities, establish minimum requirements to ensure that waste sites or facilities do not pose an unreasonable risk for adverse effects on human health or the environment. Owners and operators of landfills must demonstrate compliance with the EPS outlined below. Sites that fail to meet these standards are considered open dumps, which are prohibited by law.

No solid or special waste site or facility shall:

- Restrict the flow of the 100 year flood, reduce temporary water storage capacity of the flood plain, cause a wash out of waste, cause or contribute to the taking of any threatened or endangered species (plants, fish, or other wildlife), destroy or adversely modify a critical habitat,
- Discharge pollutants, dredged or fill materials or cause the release of non-point source pollution into waters, including wetlands of the Commonwealth, contaminate an underground drinking water source beyond the point of compliance in excess of the maximum contaminant levels (see Section 6 of 401 KAR 47:030 and section 4 of 401 KAR 30:031),
- Exist or occur unless the onsite population of disease vectors is prevented or controlled,
- Open burn solid or hazardous wastes, or violate applicable air pollution requirements (see 401 KAR chapters 50 and 63),
- Allow the concentration of explosive gases to exceed 25 percent of the lower explosive limit for gases in facility structures or the lower explosive limits for gases at the facility property boundary,
- Pose a fire hazard,
- Allow uncontrolled public access, unauthorized vehicular traffic, or illegal dumping of wastes,

- Be a public nuisance due to blowing litter, debris, or other waste materials,
- Be newly located in a wetland, and
- Violate any requirement of KRS chapter 224.

The Cabinet may not grant a variance to these regulatory requirements.

LANDFILL DEVELOPMENT

By definition, a landfill is an engineered facility for the disposal of solid or special waste that complies with the EPS and regulations. “Engineered” means there are plans and specifications to be used for construction of the facility. Plans and specifications are a substantial part of the permit application.

DESIGN CONSIDERATIONS

Facility design is based on:

- Volume and type of waste to be disposed of in a given area,
- Available land and soil volumes and types,
- Expected compaction efficiency,
- Characteristics of proposed site with regard to water pollution and gas migrations, and
- Post closure care (park, golf course, limited farming such as livestock production).

The achieved compaction efficiency will directly affect the site’s life and potential to produce contaminants. Kentucky regulations specify a compaction goal of 1,200 pounds per cubic yard. Due to high costs involved with site development and operation, it is wise to obtain high compaction efficiency. The degree of compaction obtained will vary based on the:

- Type of waste,
- Type of equipment,
- Wheel cleat width,
- Operational methods, and
- Condition of equipment.

Failure to consider facility design during operation may result in a reduction of disposal capacity and potential environmental problems.

SPECIFICATIONS

Specifications or permit application narratives are a written discussion of the methods and materials that will be used to construct the landfill. They contain performance criteria or engineering standards. Major items to be addressed in the specifications include:

- equipment/manpower needs,
- soils usage,
- life expectancy of the site,
- erosion control,
- potential problems/abatement measures,
- leachate control,
- monitoring,
- groundwater,
- surface water,
- methane or explosive gases, and
- gas control.

PLANS

Plans are engineering drawings that show:

- Existing site conditions:
 - a. topography,
 - b. streams and bodies of water,
 - c. structures including residences,
 - d. property lines, and
 - e. drinking water wells, etc.
- The proposed sequence of the operation:
 - a. drawn according to regulatory requirements,
 - b. designed to efficiently manage storm water,
 - c. designed to efficiently manage solid waste,
 - d. minimized the amount of the bond for the “maximum open area”, and
 - e. protects public health and the environment.
- Design details for construction and site operation.

The use of construction plans takes the guesswork out of landfilling. Plans allow the operator to utilize the best excavation depth into soil for covering wastes. If the cut is too shallow, possible cover material will be left in the ground or the groundwater buffer may be too large and the fill zone too small, meaning the site

will fill quicker than predicted. If the cut is too deep, the rock and earthen materials over the seasonal high groundwater table will be too small leading to possible groundwater contamination or even allow disposal of waste into the aquifer zone leading to probable groundwater contamination.

In addition, the use of plans allows the operator to track landfilling progress and to plan for future expansions. A keen manager will stay at least three years ahead of major expansion permit changes to keep the operation running smoothly. The time required for a new or horizontal expansion permit is normally:

- three to six months for a local governing body (fiscal court or 109 district) approval,
- twelve to eighteen months for consultant to obtain tentative cabinet approval of permit application, and
- twelve months for any formal hearing.

Other formal permit changes take about six months to one year.

There are six basic types of plan information that are necessary to show how a facility is to be developed. These are:

- existing conditions plan,
- site development plan,
- cross section plan,
- final contour plan,
- typical detail, and
- miscellaneous details.

Existing conditions, site development, and final contour plans are drawn using a “plan view”. Plan view plans are drawn to depict the fill as if you were in an airplane and were looking down onto the surface of the earth.

EXISTING CONDITIONS PLAN

The purpose of this plan is to show the entire site and its characteristics prior to any site development. A plan scale of 1 inch = 100 feet or less is suggested for the drawing with contour intervals at no more than 2 feet. Different contour intervals, such as five feet, may be used in hilly or mountainous terrain with the approval of the Cabinet.

The first consideration in detailing the use of a site is to show the buffer zones. Buffer zones are the regulatory distances from the waste disposal boundary to specific points and must be identified. This plan must also identify:

- monitoring points for:
 - ✓ surface water,
 - ✓ groundwater, and
 - ✓ methane
- baselines,
- drainage patterns,
- screening,
- site location,
- roads,
- bench marks, and
- land use and zoning.

SITE DEVELOPMENT PLAN

The purpose of this plan is to show the entire site and its characteristics during and after site development. A primary use of these drawings is to determine closure bond amounts at different times during landfill operations and at final closure. Closure cost estimates is based on the “maximum open area” which depends on the largest construction phase and sequence of filling. A site development plan must be drawn using 2 foot contour intervals at a scale on 1 inch = 100 feet or less. The location and sequence of filling are shown as phases. These phases should be planned for twelve month duration periods and brought up to final grade as quickly as possible. This plan must also note:

- monitoring points,
- baselines,
- drainage,
- special construction material and techniques, and
- fencing and screening.

Maximum Open Area

The design engineer must calculate the area by:

- laying out the sequence of phases diagram,
- for each phase, drawing the final, interim and long term cover for all previous phases, and

- measure the area of the waste, daily, interim and long term cover not covered by final cap.

The largest non-capped area during the operations of the landfill is the maximum open area. The owner or operator must calculate the cost of closure for this area and post a bond to cover construction.

CROSS SECTIONS

The main reason for cross sections is to accurately calculate the future waste disposal volumes. Cross sections are drawn to show the landfill if you were to slice sections of the fill and look at the side of each slice. This would be similar to looking at different pieces of a loaf of bread to form an idea of the whole. Cross sections are referenced to elevation in feet above mean sea level. The vertical scale is different than the horizontal scale and slopes appear to be steeper than they are on cross sections. Cross sections should be drawn every 100 feet along the baseline at a scale of 1 inch = 10 feet vertically and 1 inch = 100 feet horizontally.

Cross section plans show the:

- depth and height of excavation and filling,
- distance to the water table from liner system bottom,
- liners,
- cover, and
- volumes.

FINAL CONTOUR PLAN

Final contour plans are normally drawn to a scale of 1 inch = 100 feet or less and contain 2 foot contour intervals. These plans show the proposed final use of the site. Slopes and drainage patterns are shown.

OTHER INFORMATION

Plans usually show typical details or blowups of special construction or design features. Details often include:

- monitoring systems,
- groundwater monitoring wells,
- different ditch cross section design,
- cell features,
- daily lifts,

- daily, interim, long term and final cover,
- liners,
- gas vents, and
- leachate collection systems.

Other construction items that need clarification are:

- access roads,
- utilities and drainage facilities,
- employee facilities,
- communication systems,
- fire protection equipment,
- equipment maintenance facilities, and
- surface water, groundwater and gas monitoring points.

All maps, plan sheets, drawings, isometrics, cross sections and aerial photographs submitted in the solid waste application are required by regulation to:

- be of an appropriate scale to show all required detail,
- be numbered, referenced in the narrative, titled, have a legend of all symbols, horizontal and vertical scales, and specify dates of development,
- use uniform scales,
- contain a north arrow,
- use USGS data as a reference for all elevations,
- contain a survey grid with a maximum dimension of 1,000 feet by 1,000 feet square based on field monuments which reference site specific bench marks,
- show the original topography and grid system versus the construction, operation and closure topography on separate plan sheets, and
- show survey grid location and reference major plan sheets on all cross sections (401 KAR 47:160 section 8(2)).

GENERAL SITING REQUIREMENTS

SOLID WASTE LANDFILLS

Siting requirements (401 KAR 48:050) outlined below apply to all new residual, C/D/D and contained landfills.

Flood plains

Sites cannot restrict the flow of the 100 year flood or reduce the temporary water storage capacity of the flood plain. Operations methods at the site must prevent the washout of waste. New contained landfills will not be permitted in the 100 year flood plain.

Seasonal High Water Table

The lowest component of the bottom liner of a landfill must be at least four feet above the seasonal high groundwater table.

Buffer Zones

The distance between the fill area and the following must be:

- Property line 250 feet
- Intermittent or perennial stream
(unless a water quality certification is issued) 250 feet
- Residence 250 feet
- Feature of karst terrain (sinkhole) 250 feet
- Gas, sewer, or water lines 50 feet
- Unplugged wells (except monitoring wells) 250 feet
- Wastes cannot be placed in the zone of collapse of deep mine workings or within the critical angle of draw of such workings.

Airports:

- No landfill may pose a hazard to aircraft due to birds,
- No new contained landfill will be permitted within 10,000 feet of an airport used by turbo jet aircraft or within 5,000 feet of an airport used by piston-type aircraft, and
- Under federal criteria, the owner of any new site within five miles of an airport must notify the airport and FAA.

Fault Areas:

- Waste cells cannot be located within 200 feet of a fault that has had displacement in Holocene time (i.e., within the last 10,000 years).

Aquifers:

No facility shall be permitted unless:

- The uppermost aquifer can be monitored to detect the constituents identified in 401 KAR 48:300 section 10 (the "big" list), and
- Corrective action can be performed on the aquifer as specified in 401 KAR 48:300.

SPECIAL WASTE LANDFILLS

Siting requirements, outlined below, apply to all new special waste landfills (401 KAR 45:130).

Flood Plains

Sites cannot restrict the flow of the 100 year flood or reduce the temporary water storage capacity of the flood plain. Operational methods at the site must prevent the washout of waste.

Buffer Zones:

The distance between the fill area and the following must be:

- Property line 100 feet
- Intermittent or perennial stream
(unless a water quality certification is issued) 250 feet
- Sinkhole or other similar feature of karst terrain 250 feet
- Wastes cannot be placed in the zone of collapse of deep mine workings or within the critical angle of draw of such workings.

Aquifers:

No facility shall be permitted unless:

- The uppermost aquifer can be monitored to detect the constituents identified in 401 KAR 45:160, and
- Corrective action can be performed on the aquifer as specified in 401 KAR 45:160

TECHNICAL STANDARDS FOR LANDFILL DESIGN

Kentucky's regulations will recognize four categories of fully permitted landfills:

- Special waste,
- Residual
- >1 acre construction/demolition/debris, and
- contained.

The design and closure standards for each category of landfill are specified by regulation and are meant to facilitate compliance with the Environmental Performance Standards.

As outlined in the “Permitting Process”, the technical application, the third phase in the solid waste application process, is devoted to outlining the specific design of the facility. The special waste landfill application also contains design information as a part of the one step application process. This is accomplished through submittal of application narrative and engineering drawings and specifications.

This section outlines technical requirements applicable to all solid and special waste sites or facilities, plus the specific design and closure requirements for residual, construction/demolition/debris, contained and special waste landfills.

TECHNICAL REQUIREMENTS APPLICABLE TO ALL SOLID WASTE LANDFILLS

The contents of the technical application are based on the specific type of facility proposed but must include the following:

- engineering plans showing the design of the site and liner,
- design and operations narrative,
- closure and closure care plans, which outline the landfill cap design and a cost estimate for these activities. Prior to issuance of the construction/operating permit, a performance bond must be submitted which meets the requirements of 401 KAR 48:310,
- surface and groundwater monitoring plans which meets the requirements of 401 KAR 48:300, and
- construction quality control plan which outlines:
 - ✓ who will be responsible for each part of the quality control plan,
 - ✓ frequencies and specifications for inspections and tests,
 - ✓ forms to be used,
 - ✓ survey control system, and
 - ✓ a statement to be used for certifying that the quality control plan was followed by the owner.

This plan must also provide assurance that the layers of the homogeneous low permeability soil liners (clay) are compacted using nonvibratory compactors with full depth penetrating feet with a minimum of six passes per soil layer.

- Recordkeeping and reporting systems which adequately addresses the regulatory requirements relative to:
 - ✓ Construction quality control,
 - ✓ Annual surveys,
 - ✓ Surface water and groundwater sampling, and
 - ✓ Weight records.

Contained landfills are required to keep permanent records of the source, disposal locations, and quantity of spill residues and limited quantity generator hazardous wastes and source and quantity records on all other wastes. The owner would have a system tracking the disposal location of such unregulated hazardous waste:

- An “X-Y-Z” three dimensional grid system tied to a benchmark, or
- A note on the daily waste disposal report if the working area is tied to a coordinate system.

Contained landfills meet Federal “Subtitle D” requirements for Municipal Solid Waste landfills. As such, they are designed to meet requirements for disposal of household hazardous waste (HHW) and conditionally exempt small quantity generator (CESQG) hazardous waste. Generally speaking, a company or business may not produce more than 100 kg. (220 pounds) of waste that contain hazardous constituents at any one location unless they register as a hazardous waste generator. Please refer to 401 KAR 31:010 section 5 for the definitions and requirements for conditionally exempt small quantity generators. The plastic liner, clay liner and extensive groundwater monitoring guards against escape of these chemicals, according to U.S. EPA. Therefore, the Cabinet encourages landfill owners to provide a disposal site for Kentucky’s small quantity hazardous waste as a service to its customers.

RESIDUAL LANDFILLS

DESIGN REQUIREMENTS

As discussed in “The Permitting Process”, residual landfills are designed and operated for the disposal of a specific type waste; thus, each design will vary. The regulations specify that the engineering design must be capable of meeting the

Environmental Performance Standards, siting standards and consider the following:

- Volume to be disposed,
- Climate of area,
- Permeability of the liner material,
- Type of soil(s) underneath the facility,
- Hydrogeologic characteristics of the facility; including quality, quantity, current use and direction of groundwater flow,
- Proximity of the site to surface water and groundwater,
- Potential for gas emissions and odors,
- Design of the leachate, runoff and gas migration control systems relative to the specific waste to be disposed, climate and volume of leachate to be collected, and
- Characteristics of the waste – including how the liner and cover material will prevent hazardous chemicals from contaminating groundwater and surface water. A good rule of thumb is to use clay for waste containing only metals and a composite liner (clay and synthetic) for wastes containing organics. Otherwise, the engineer should model the effects of any hazardous substance migration through the liner and into the groundwater. Use the EPA help, ODAST, MODFLOW or similar to predict groundwater impacts of the given design.

To determine groundwater monitoring parameters, the applicant should:

- Do a waste analysis for those substances on the list in:
 - ✓ 40 CFR 264 Appendix IX (also 401 KAR 34:360),
 - ✓ 401 KAR 48:300 section 10 (the “big” list), or
 - ✓ the list of priority pollutants, or similar list.
- List any chemicals at concentrations above the detection limit for use in characterization groundwater monitoring,
- Chose several of the higher concentration organics and metals as “markers” for quarterly detection groundwater monitoring, in addition to the indicator and metals parameters specified in 401 KAR 48:300 section 11(2) for Residual and Construction/Demolition/Debris landfills, and
- Use the “markers” for modeling the liner and cap performance with regard to protecting groundwater.

CLOSURE AND CLOSURE CARE REQUIREMENTS

As part of the technical application, the applicant is required to develop closure plans for the site to ensure compliance with the Environmental Performance Standards. A residual landfill closure plan must address:

- Type and amount of waste in the facility,
- Mobility and expected rates of migration of the waste and leachate,
- Site:
 - ✓ Location,
 - ✓ Topography,
 - ✓ Surrounding land use, and
 - ✓ Final site use.
- Climate,
- Characteristics of the cover material, such as:
 - ✓ Composition,
 - ✓ Erodibility (ability to wash out),
 - ✓ Slope stability,
 - ✓ Surface contours (hilliness),
 - ✓ Thickness,
 - ✓ Porosity (the amount of holes or holiness),
 - ✓ Permeability (ability to slow water flow),
 - ✓ Slope,
 - ✓ Length of run of slope, and
 - ✓ Type of vegetation to be used.
- Geologic profiles,
- Soil profiles,
- Surface water flow, and
- Subsurface hydrology.

Once the facility owner quits accepting wastes, he begins to cap the landfill. When the construction is completed, the owner notifies the Division whom must inspect the site. A DWM representative inspects the site and reviews the records to determine the site's compliance with all regulatory requirements. A ninety percent permanent vegetation cover must be in place before the request for a final construction inspection is made.

After the Division accepts the owner's closure report, the facility must be maintained and monitored for a minimum of two years. This period is referred to as the closure care period. Once the two year closure care period expires, a DWM representative must inspect the site and review the records to determine the site's compliance with all regulatory requirements and that a ninety percent permanent

vegetation cover exists. If the site is in compliance, the Division may release the closure and closure care bonds per 401 KAR 48:060 section 3(6) and KRS 224.40-650(3).

The owner or operator must implement this plan, plus any other corrective work specified by the Division, according to the closure care schedule. The deed for the property has to be altered to notify future purchasers of the following:

- Location of the waste disposal area,
- Time of operation of the facility,
- Nature of the waste, and
- Caution against future disturbance.

Once this work has been accomplished, the Division may accept the closure care certification prepared by the owner or his representative.

CONSTRUCTION/DEMOLITION/DEBRIS LANDFILLS

DESIGN REQUIREMENTS

Technical requirements specified for C/D/D landfills are outlined in 401 KAR 48:060. These requirements are the bare minimum of standards that must be met. This means that the design and closure plans submitted must at least meet the following criteria:

- They must be designed to keep surface water flows and leachate separate by:
 - ✓ Minimizing surface water running onto or through the operational or completed fill areas,
 - ✓ Designing diversion ditches and structures for a 100 year/24 hour storm flow (about 6 to 7 inches of rain), and
 - ✓ Designing sediment basins (silt pond) and emergency spillways:
 - To retain and safely pass a 25 year/24 hour storm event (about 4 to 5 inches of rain),
 - To pass a 100 year/24 hour storm event (about 6 to 7 inches of rain) through the emergency spillway (ditch to carry the extra water that would have broken the dam) with no flow exceeding the design freeboard (i.e., space between the top of the water and top of the ditch),
 - To allow sediment storage from an operating period of one year (one may use shorter times with a more frequent clean out schedule),

- With specified sediment basin clean out elevations (i.e., time to remove the soils when the top of the dirt reaches this mark), and
 - Using designs verified by a unit hydrograph method of calculation (an engineering method to calculate flow).
- **Liner and leachate collection systems** must be designed with the following:
 - ✓ The bottom liner, covering the bottom and sidewalls, consisting of:
 - 12 inches of soil, and
 - 12 inches clay with 1×10^{-7} centimeters per second maximum permeability or its equivalent (i.e., ten years for one foot of water to break through the bottom of one foot of clay).
 - ✓ Leachate collection system in areas with a slope of less than 25 percent which:
 - Have a drainage layer of 12 inches of material with a minimum permeability of 1×10^{-3} centimeters per second or its equivalent (i.e. sand),
 - Is designed for a maximum head (standing water depth) of 12 inches,
 - Used four inch diameter, perforated lateral pipes which are:
 1. installed perpendicular (right angles, or 90°) to flow, and
 2. with the piping layout having a minimum slope of one percent.
 - Uses an 8 inch diameter pipe for trunk lines, and
 - Has a filter fabric (i.e. cloth) or other material design to protect the integrity of the drainage layer, and a filter fabric protection layer of 12 inches of material with a minimum permeability of 1×10^{-3} centimeters per second or its equivalent (sand). The Cabinet frequently waives these two requirements if the applicant can show equivalent environmental protection (little or not clogging of the sand by the waste constituents).
- The leachate collection tank with 1,000 gallons minimum plus storage volume for fifteen days of peak production capacity during operation or closure using the HELP (Hydraulic Evaluation of Landfill Performance) Model. This is usually the wettest fifteen day period during 20 years of area rainfall data,
- A description of how the leachate will be measured disposed of and documented. If using an off site wastewater treatment plant, provide an approval letter from the owner of the treatment facility,

- Adequate solid material must be documented to provide coverage of one foot of compacted cover at the end of the week or on lifts of 10,000 square feet area, whichever occurs first (for example, if you spread 20,000 square feet of wastes in one week, you must apply cover twice),
- Surface and groundwater monitoring plan which meets 401 KAR 48:300,
- Equipment sufficient to handle waste stream,
- Identify an area for handling hot or smoldering load and other special handling problems, and
- Include a shelter for operating personnel, which has potable water, sanitary facilities, lights, heat and screened windows.

When the applicant restricts the waste to non-putrescible wastes and wastes that will not leach, the liner may be modified to consist of:

- Two feet of soil re-compacted to 90 percent standard proctor, and
- No leachate collection system.

Non-putrescible means tightly baled paper or cardboard, wood boards, logs, stumps, asphalt, concrete, etc. Putrescible means anything subject to rapid decomposition such as loose paper or cardboard, wood shavings or chips.

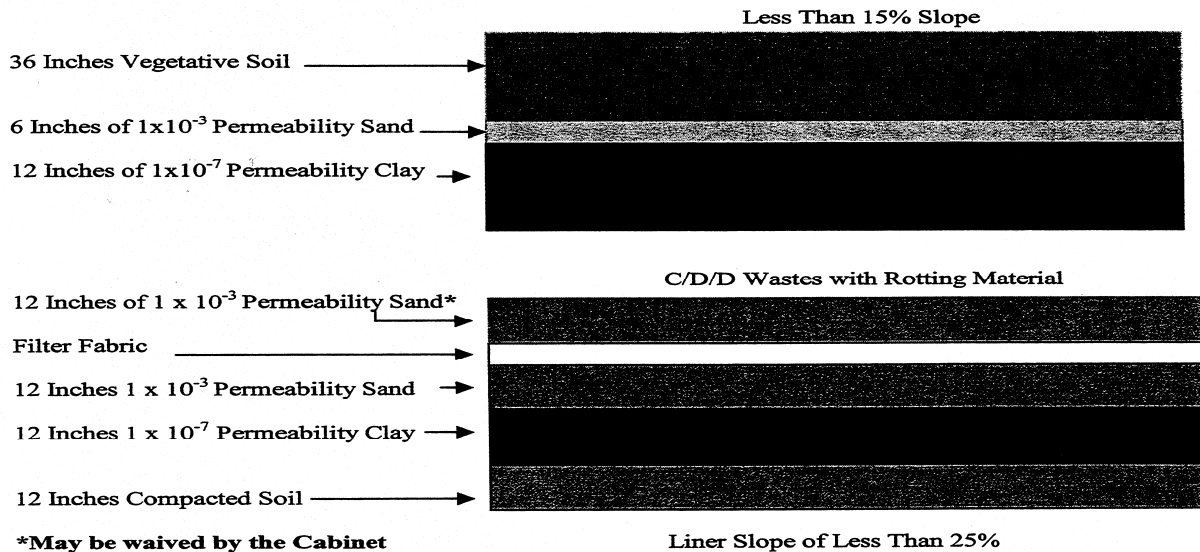


Figure 4-1 Outlines the Minimum Liner and Cap design Described

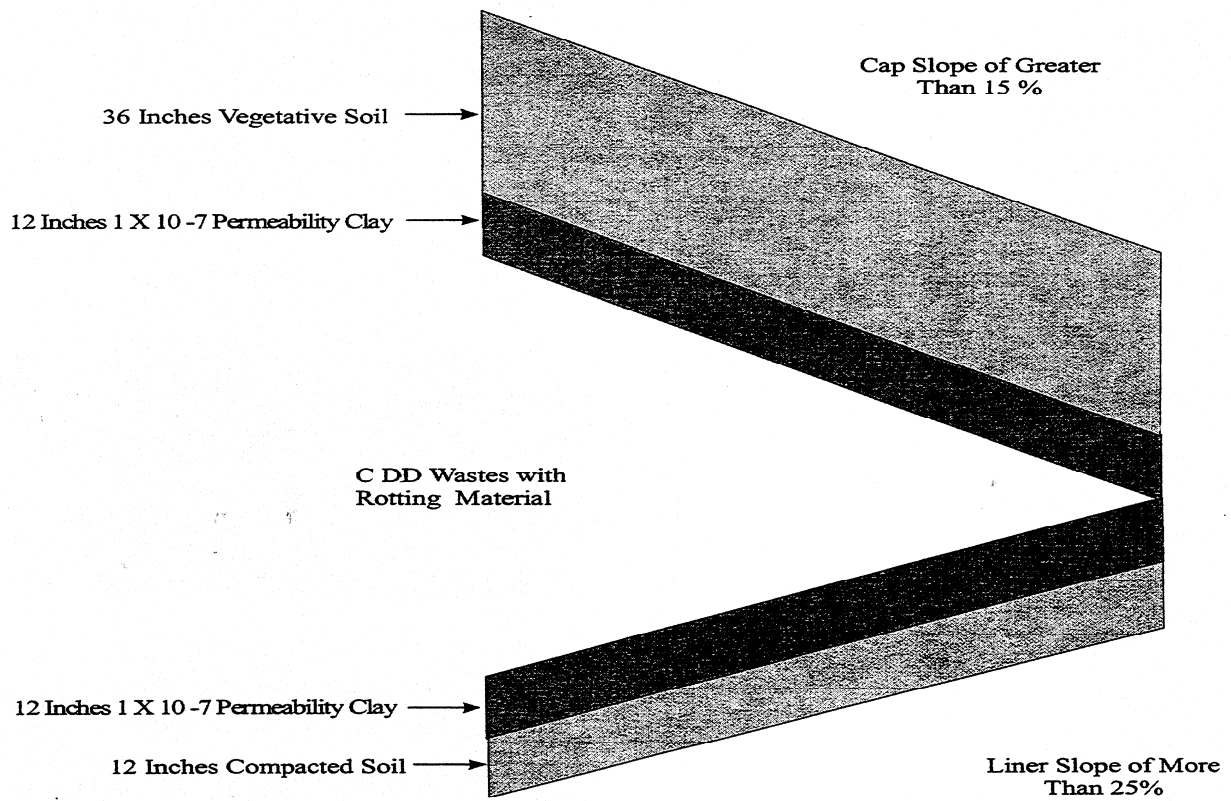


Figure 4-1b
Construction-Demolition Debris Landfill
Putrescible Wastes Design Cross Section
On Slopes

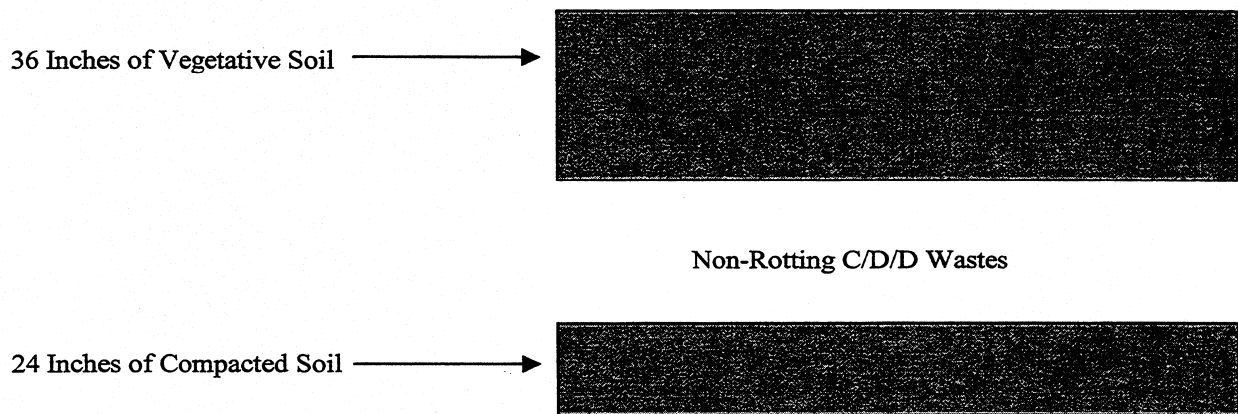


Figure 4-1c
Construction/Demolition/Debris Landfill
Non-Putrescible Wastes Design Cross Section

CLOSURE AND CLOSURE CARE REQUIREMENTS

The technical application requires the applicant to develop a closure plan, which describes:

- The procedures and schedule for final closure,
- The phased closure and sequence, and
- The final cover designed to meet the following (starting with the first layer above the interim cover):
 - ✓ Waste cells graded to a slope of more than 5 and less than 25 percent,
 - ✓ 12 inches of a minimum 1×10^{-7} cm/sec permeability clay or its equivalent,
 - ✓ on slopes of less than 15 percent, six inch drainage layer of 1×10^{-3} cm/sec permeability sand with a system of drainage tiles to relieve water collected,
 - ✓ Filter fabric to protect the drainage layer,
 - ✓ Three feet of vegetative cover,
 - ✓ Diversion berms for locations where the runoff exceeds the holding capacity of the final cover, and
 - ✓ When the wastes in the landfill have been restricted to non-putrescible wastes or wastes that don't leach, the final cover layer may be reduced to a minimum of 3 feet of vegetative soil.

Closure regulations require the owner or operator to:

- Implement the closure plan and schedule. The owner or operator may submit a modification 90 days prior to the last date for accepting waste,
- Place final cover within 365 days over areas of the landfill which are completely filled (reached the final grade or maximum planned elevation),
- Not remove earth moving equipment until the Division inspects the site and determines compliance with approved plans and specification,
- Submit the records that the owner shall submit to verify quality control of the cap,
- Alter the deed to caution against future site disturbance of the area and proof of this change provided,
- Obtain the bond release two years following the Division's acceptance of the closure certification,
- Maintain the sign which lists the name, address and telephone number of the owner during closure care (401 KAR 48:060 section 2(5)),

- Perform corrective action work as specified by the Cabinet after the final cap inspection, and
- Follow the closure care plan for a minimum of 2 years which includes narrative on the activities to be undertaken after closure relative to:
 - ✓ Surface and groundwater monitoring,
 - ✓ Leachate collection and treatment,
 - ✓ Cap erosion and sediment control,
 - ✓ Cap re-vegetation and regarding,
 - ✓ Access controls, and
 - ✓ A schedule for monitoring and accomplishing these activities.

Registration of less than one acre sites for C/D/D wastes holds down the demand for full permits. The Cabinet added requirements in September of 1999 in 401 KAR 47:110 and the new 48:320. New regulations require that:

- The owner undergo a five day waiting period before the registration automatically takes effect to allow the Cabinet to check the background (compliance record) of the applicant,
- That the applicant publish a newspaper notice two weeks before submission of the registration,
- The Cabinet to hold a public meeting upon the request of any individual,
- The applicant to prepare a Groundwater Protection Plan (GPP) per 401 KAR 5:037,
- No two landfills be within 750 yards, and
- For landfills within a wellhead protection area (WPHA), as defined in 401 KAR 5:002 section 1, shall construct and maintain a liner and leachate collection system:

✓ **The Liner**

- Is a low permeability soil component with a minimum of twelve contiguous inches of 1×10^{-7} cm/sec maximum permeable material (clay) or its equivalent, and
- Covers the bottom and sidewalls of the facility with the bottom liner sloped toward the leachate collection system that complies with subsection 3 of this section.

✓ **The leachate collection system**

- Must have a minimum of a twelve inch layer of gravel or a layer of equivalent performance and a toe drain, and
- Discharges into a collection tank with a minimum capacity of 1,000 gallons.

For more information on WPHA contact the Groundwater Branch at (502) 564-3140.

CONTAINED LANDFILLS

DESIGN REQUIREMENTS

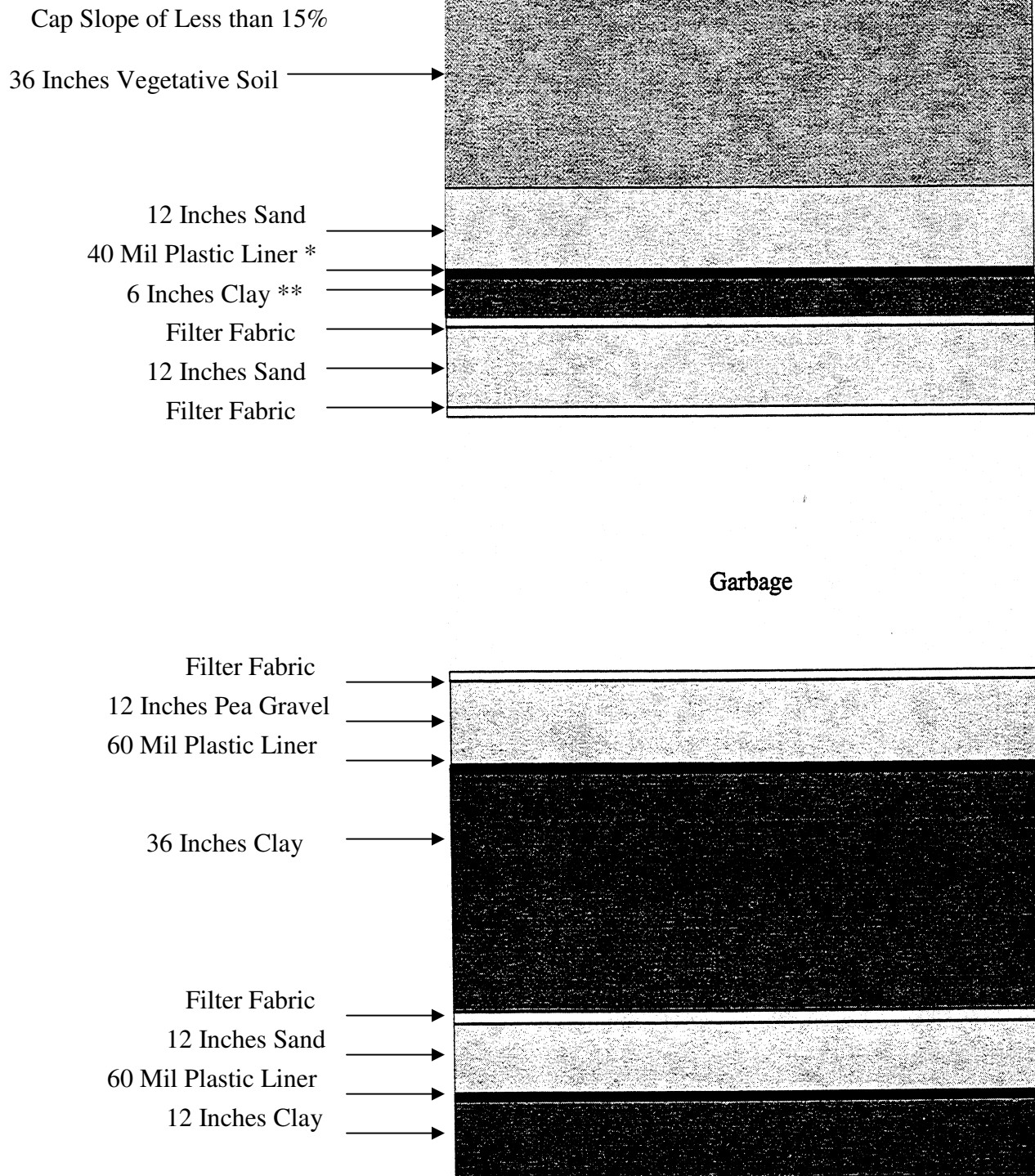
Design requirements for contained landfills are outlined in 401 KAR 48:070 and 48:080. These chapters outline the minimum design standards for the liner and cap. Owners or operators must ensure that the narrative and design:

- Maintains the separation of surface water and leachate. The contours of the landfill must minimize the surface water that runs on or through the landfill,
- Allows ditches to withstand a 100 year, 24 hour storm flow (runoff from a 6 to 7 inch rainfall),
- Meets the following requirements for sediment basins:
 - ✓ The emergency spillway must pass a 100 year, 24 hour storm event without over flowing,
 - ✓ The storage and principal spillway discharge must not flow into the emergency spillway (ditch that carries water that would have washed away the dam) during a 25 year, 24 hour storm event (rainfall of 4 to 5 inches),
 - ✓ The pond must have a one year sediment (silt) storage volume,
 - ✓ The flow must have verification by the unit hydrograph method of calculation, and
 - ✓ The downhill toe of the slop of the sediment pond dam must be 50 feet from the property line
- Enables the landfill to resist the maximum anticipated horizontal acceleration in lithophytic material if it is constructed in the seismic impact zone,
- Ensures the stability of the system components (i.e., liner, leachate collection system, cover) for landfills located in unstable areas (i.e., karst, underground mines, unstable slopes),
- Ensures that sufficient equipment be onsite to compact wastes received within 2 hours. Backup equipment must be available within 24 hours. A recordkeeping system must be proposed to address equipment maintenance.
- Ensures an in-place waste density of at least 1,200 pounds per cubic yard,
- Addresses soil availability to meet the liner and cap construction needs (clay volumes and permeability),
- Includes a building for personnel which:
 - ✓ Heated
 - ✓ Air-conditioned or screened, and

- ✓ Potable water and sanitary facilities.
- Includes a building which is large enough to hold the largest piece of equipment for maintenance,
- Ensures that each building has a monitoring alarm system to detect explosive gases,
- Outlines a quarterly methane monitoring program which addresses:
 - ✓ The control of explosive gases per EPS of 401 KAR 47:030,
 - ✓ Soil and water properties of the area around the landfill,
 - ✓ Location of facility structures and boundaries,
 - ✓ Gas venting system with minimum of one vent per acre, and
 - ✓ Location of surrounding off site structure and residences.
- Meets the following roadway requirements:
 - ✓ Construction of a road from the publicly maintained highway to the waste disposal area,
 - ✓ Construction of an all weather perimeter road (gravel or paved) around the landfill to each monitoring and sediment control structure,
 - ✓ Internal roads must be all weather and designed to within 200 feet of the working face,
 - ✓ All roads must be designed wide enough to allow passage of vehicles, carry normal traffic, and properly drain, and
 - ✓ Entry to landfill must have enough space to safely accommodate trucks and prevent delays on the public roadway (include stacking lanes).
- Has a safety and communication plan which addresses:
 - ✓ Heavy equipment safe operation and maintenance to prevent accidents and breakdowns, and
 - ✓ Description of:
 - Communication equipment such as radios, mobile phones and base telephones,
 - Fire fighting procedures, and
 - OSHA related requirements.
- Has scales to weigh all waste,
- Has an adequate:
 - ✓ Tank storage based on predicted leachate volumes,
 - ✓ Method of leachate measurement,
 - ✓ Liquid removal schedule, and
 - ✓ Treatment method
- Has a liner containing (starting from the bottom and going up):

- ✓ A sub-grade: the landfill sub-grade is the upper rock layer, soil layer, or select fill that is the foundation to support the liner. This sub-grade must be:
 - Graded according to plan,
 - Sufficiently dry and stable,
 - Free of organic material, and
 - Verified by a minimum of 9 tests per acre to determine sub-grade compaction. Sufficient cross sections must be taken to document the finished elevation.
- ✓ For any areas of less than 10 percent slope, a secondary composite liner, which must consist of:
 - A 12 inch thick clay layer with a permeability of 1×10^{-7} cm/sec (i.e. takes ten years for one foot of water to penetrate),
 - Synthetic liner with a nominal thickness of 60 mils (a mil is one thousandth of an inch),
 - A 12 inch drainage layer with a permeability of 1×10^{-3} cm/sec (sand), and
 - Filter fabric
- ✓ For all area, a primary composite liner with:
 - A 36 inch thick clay layer with a permeability of 1×10^{-7} cm/sec,
 - A 60 mil thick synthetic liner,
 - A 12 inch drainage layer with a permeability of 1×10^{-3} cm/sec (sand),
 - A filter fabric to protect the drainage layer,
 - Geonet composite, a synthetic drainage netting glued to upper and lower filter fabrics, may replace the drainage layer on slopes greater than ten percent, and
 - Geosynthetic Clay Liner (GCL) on two foot thick clay sub-grade may replace the 36 inch Compacted Clay Liner (CCL).
- ✓ A leachate collection system that uses:
 - A maximum static head of 12 inches of depth,
 - Eight inch diameter schedule 80 plastic pipe for the main collection lines or another design that meets the 12 inch maximum leachate depth rule,
 - Four inch lateral lines installed perpendicular to flow or another design that meets the 12 inch maximum leachate depth rule,
 - A design for the pipes to withstand all encountered static and dynamic load (dead and live loads),

- A one percent minimum slope for piping,
- A leachate collection tank with 1,000 gallons plus 15 days at peak production rates during operation or closure (using the HELP Model),
- An identified and assured disposal method (letter of acceptance from an off site Publicly Owned Treatment Works (POTW)), and
- Allowances for inspection and cleaning.

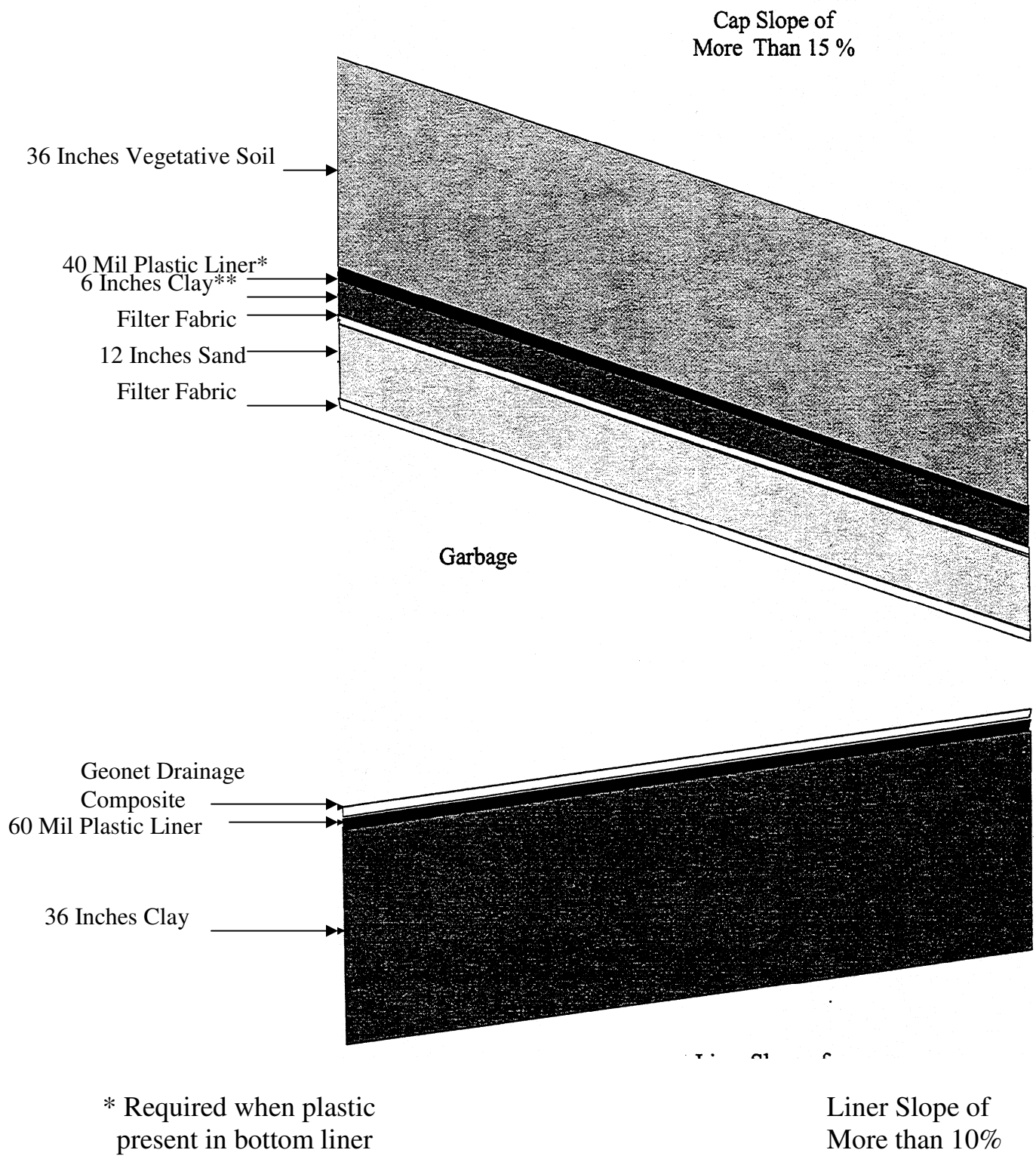


* Required when plastic
present in bottom liner

** Required by Cabinet

Figure 4-2a
Contained Landfill Design
Cross Section Flat Areas

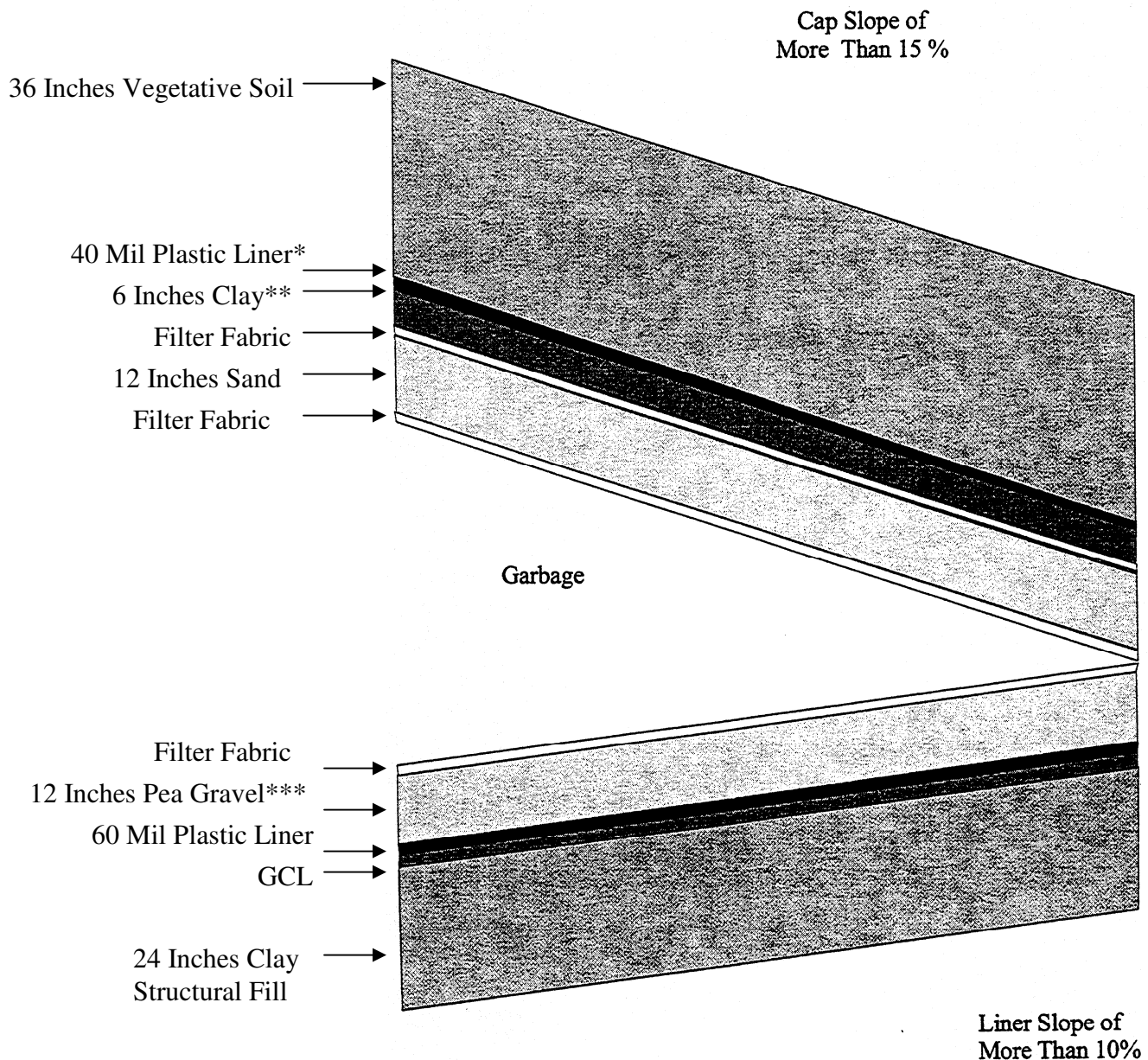
Liner Slope of
Less than 10%



* Required when plastic
present in bottom liner

** Required by Cabinet

Figure 4-2b
Contained Landfill
Design Cross Section
Sloped Areas



* Required when plastic
present in bottom liner

** Required to plug Microholes

*** Required for Flow and Liner Protection

Figure 4-2c
Contained Landfill
Design Cross Section
Geosynthetic Clay Liners (GCL)

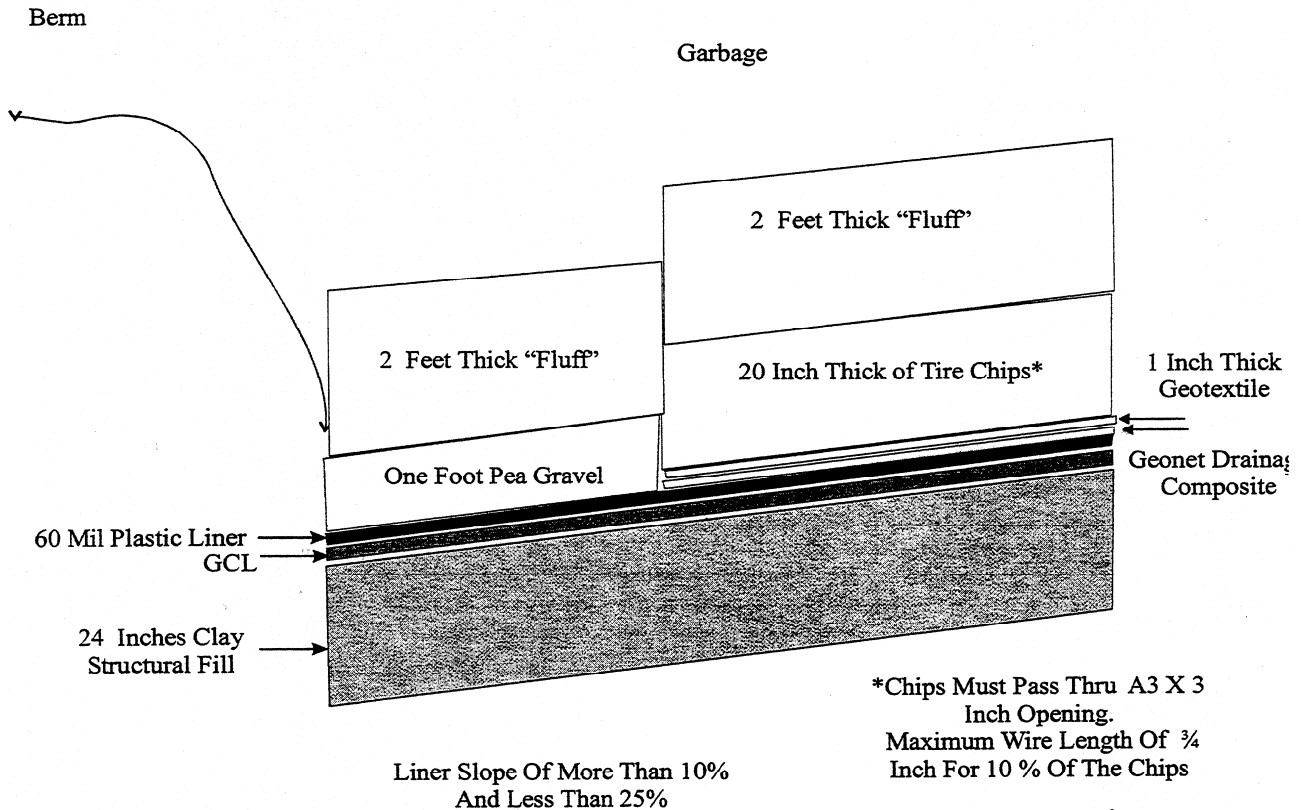
The recent past has documented several problems with the design and operation of leachate collection systems at contained landfills. Failure to divert rainfall runoff and runoff away from the leachate collection layer overloaded the systems with rainwater and dilute leachate that nevertheless must be transported to a POTW for disposal (similar to mixing storm water and sewage). This results in

an enormous increase in hauling and treatment costs or increases temptation to directly discharge to a stream. One company performed an open dump clean up work over one million dollars in response to illegal discharges. Solutions include:

- The design and installation of plastic liner flaps between the new liner area and the current disposal area,
- Construction of a smaller cell since plastic encourages runoff (one year maximum is recommended),
- Installing partial berms between cells to separate leachate flows from filled area from surface water in new areas,
- Covering the entire new cell with waste and interim cover while directing rain water (runoff) from the top of the interim cover through the sediment pond,
- The design and installation of a drain pipe through the “dam” at the bottom of the landfill for storm water gravity flow (less expensive than pumping but must seal prior to filling),
- The design and installation of temporary runoff ditches from the covered working area to the main runoff ditches connecting to the sediment pond (Designed by a Professional Engineer per 401 KAR 48:070 section 7(2)(C)), and
- Partnering the consulting engineer and the manager to sequence filling, i.e., onsite visits to look at the current situation and plan a way out for the storm water as filling progresses.

METHODS OF OPERATION

- Prepare line,
- Plan to deposit refuse at bottom of slope for best control of surface water and blowing litter,
- Prepare a waste dumping berm high enough for the protective layer and first waste layer,
- Spread refuse using light weight equipment (such as a D-5 or equivalent), and
- Continue placing next lift normally using a landfill compactor.



**Figure 4-3
Contained Landfill
Starter Berm and Liner Protection
Sloped Areas**

LINER PROTECTION

The Cabinet requires protection of the newly constructed contained landfill liner to prevent boards, pipes and other potentially damaging material from puncturing the plastic and clay system. This is even more important as more designers specify GCL and geocomposite drainage netting instead of CCL and one foot of gravel. The new clay material, while much more resistant to water infiltration, is much thinner than the traditional clay liner. The GCL is typically less than one-half inch thick compared to the thirty-six inch thick normal liner. The drainage net is also much thinner. The Cabinet has sent the following correspondence on the issue:

- September 15, 1999 Notice to All Contained and C/D/D landfills,
- November 17, 2000 letter to each contained landfill, and
- December 21, 2000 letter to each contained landfill.

A copy of each is in the appendix. The options for GCL/geonet liner protection include:

- ✓ Placing six to twelve inches of sand or gravel on top of the GCL/drainage net,
- ✓ Placing two feet of “fluff” free of any damaging objects, such as boards or pipes, on top of the twelve inch thick drainage layer or sand/gravel protective layer. This may require:
 - Route management so that haulers pick up none of these objects during fluff layer placement,
 - Diversion of C/D/D waste trucks to the C/D/D landfill unit,
 - Spotters to remove objects on the floor of the cell to remove damaging objects, and
 - Use of a D-5 or equivalent or smaller equipment for spreading.
- ✓ Use of tire derived chips (TDC):
 - Place a cushion layer of one inch thick filter fabric or six inches of sand or gravel over the Geosynthetic drainage netting/GCL, and
 - Place 20 inches of TDC with 80 percent passing three inch nominal and 90 percent having less than or equal to $\frac{3}{4}$ inch long wire.

FINAL CAP

The cap is a layered system which must maintain a slope between five and twenty-five percent. The components of the cap are (from bottom to top):

- Filter fabric,
- Twelve inch thick sand gas venting system with a minimum hydraulic permeability of 1×10^{-3} cm/sec,
- Filter fabric to protect the venting system,
- Eighteen inch thick clay layer with a minimum permeability of 1×10^{-7} cm/sec,
- For areas with a slope of less than fifteen percent, a twelve inch thick drainage layer with a permeability of 1×10^{-3} cm/sec sand, and
- A thirty-six inch thick vegetative cover.

Reference Figure 4-2 for a drawing of the minimum liner and final cap design for a contained landfill.

CLOSURE AND CLOSURE CARE REQUIREMENTS

The owner is required to prepare a closure plan as part of the technical application, which describes all the necessary steps to close all units of the landfill and provide maintenance. This plan must identify:

- Methods, procedures, and processes to close each unit in accordance with the:
 - ✓ Environmental Performance Standards of 401 KAR 47:030,
 - ✓ Groundwater rules of 48:300, and
 - ✓ Closure regulations in:
 - 48:070 section 15,
 - 48:080 section 8 through 10, and
 - 48:090 section 13.
- An estimate of the maximum open area or uncapped area for each landfill unit (or phase),
- A schedule for completing closure that includes beginning within thirty days following the final receipt of waste,
- The methods to maintain final cap, including necessary repairs due to erosion, settling, etc.,
- The maintenance and operation of the:
 - ✓ Leachate collection system,
 - ✓ Groundwater monitoring system, and
 - ✓ Explosive gas monitoring system.
- The name, address and telephone number of the contact person for the thirty year closure care period, and
- The description of the planned use of the property.

Following closure of a designated unit, the owner must submit a certification by a professional engineer that the phase has been closed in accordance with the approved plan. A copy of the approved closure plan must be kept onsite until the closure care period has ended. Once the Division has accepted the certification of closure, the owner must alter the deed to notify all potential purchasers of the location and time of operation, type of waste disposal, and caution against future disturbance of the area. Proof of this deed change is required before the Cabinet acceptance of the cap and release of the closure bond.

SPECIAL WASTE LANDFILLS

DESIGN REQUIREMENTS

Special waste landfills are designed and operated for the disposal of a specific type waste; thus, each design will vary. The regulations at 401 KAR 45:110 specify that the engineering design must be capable of meeting the EPS of 401 KAR 30:010 and the siting standards of 401 KAR 45:310 considering the following:

- Volume to be disposed,
- Climate of the area,
- Permeability of the liner material,
- Types of soil(s) underneath the facility,
- Hydrogeologic characteristics of the facility, including quality, quantity, current use and direction of groundwater flow,
- Proximity of the site to surface water and groundwater,
- Potential for gas emissions and odors,
- Design of the leachate, runoff and gas migration control systems relative to the specific waste to be disposed, climate and volume of leachate to be collected, and
- Characteristics of the waste, including how it will react when it comes in contact with the liner, cover materials and water. A good rule of thumb is to use clay for waste containing only metals and a composite liner (clay and synthetic) for wastes containing organics.

For coal combustion ash groundwater monitoring parameters, the applicant uses those specified in 401 KAR 45:160 section 8(2).

To determine groundwater monitoring parameters for wastes other than coal combustion ash, the applicant should:

- Do a waste analysis for those substances on the list in:
 - ✓ 40 CFR 264 Appendix IX (also 401 KAR 34:360),
 - ✓ 401 KAR 48:300 section 10 (the “big” list), or
 - ✓ the list of priority pollutants or similar list.
- List any chemicals at concentrations above the detection limit for use in characterization groundwater monitoring, and
- Chose several of the higher concentration organics and metals as “markers” for quarterly detection groundwater monitoring.

CLOSURE AND CLOSURE CARE REQUIREMENTS

As part of the technical application, the applicant is required to develop closure plans for the site to ensure compliance with the EPS. A special waste landfill closure plan must address:

- The type and amount of waste in the facility,
- Mobility and expected rates of migration of the waste and leachate,
- Site:
 - ✓ Location,
 - ✓ Topography,
 - ✓ Surrounding land use, and
 - ✓ Final site use.
- Climate,
- Characteristics of the cover material, such as:
 - ✓ Composition,
 - ✓ Erodibility,
 - ✓ Slope stability,
 - ✓ Surface contours,
 - ✓ Thickness,
 - ✓ Porosity,
 - ✓ Permeability,
 - ✓ Slope,
 - ✓ Length of run of slope, and
 - ✓ Type of vegetation to be used.
- Geologic profiles,
- Soil profiles,
- Surface water flow, and
- Subsurface hydrology.

This plan plus any other corrective work specified by the Division must be implemented according to the closure care schedule. The deed for the property has to be altered to notify future purchasers of the:

- Location of the waste disposal area,
- Time of operation of the facility,
- The nature of the waste, and
- Caution against future disturbance.

Once this work has been accomplished, the Division may accept the closure care certification prepared by the owner or his representative.

After the Division accepts the owner's closure certification, the facility must be maintained and monitored for a minimum of five years. This period is referred to as the post closure periods. Once two years has past, the Cabinet may release the bond equal to:

- The closure cost estimate, and
- Two years of post closure maintenance.

This means that the bond should still contain enough for the final three years of maintenance (see 401 KAR 45:110 section 5(6)).

Once the five year closure care period expires, the site must be inspected and records reviewed to determine the site's compliance with all regulatory requirements and that a ninety percent permanent vegetation cover exists. If the site is in compliance, the Division must release the closure bond within 180 days of its determination.

STUDY GUIDE

THE LANDFILL

1. A landfill is a solid waste disposal facility that is designed, operated and closed in a manner that complies with the _____
_____.
2. Environmental performance standards establish minimum standards to ensure that all solid waste sites or facilities:

3. Facility design considerations are based on:

4. The degree to which waste can be compacted is determined by

5. The degree of compaction directly affects the _____
_____ and the potential to increase _____ production.
6. Kentucky regulations specify a compaction goal of ___ pounds per cubic yard.
7. _____ are a substantial part of the permit application, which is incorporated into the permit, by reference.

8. Describe the differences between specifications and plans.

SPECIFICATIONS

PLANS

9. Specifications include:

10. Plans are engineering drawings that show:

11. The six basic types of plan information necessary to show how a facility is to be developed are:
-
-
-
-
-
-
12. _____ plans show the entire site and its characteristics prior to any site development.
13. _____ plans show the entire site and its characteristics during and after site development, including the sequence of filling.
14. _____ plans are used to accurately calculate future or remaining waste disposal volumes.
15. A keen manager will stay at least _____ years ahead of major permit expansions to keep things flowing smoothly
16. _____ plans show the proposed final use of the site.
17. Plans for other information often include detailed information on:
-
-
-
-

18. All maps, plan sheets, drawings, isometrics, cross-sections, and aerial photographs submitted in the solid waste application must:
-
-
-
-
-
-
-
-
19. What are the six general siting requirements that must be considered for all solid waste landfills?
-
-
-
-
-
-
-
-
20. Landfills that will restrict the flow of the _____ year flood cannot be constructed.
21. The lowest component of the bottom liner of a landfill must be at least _____ feet above the seasonal high water table.
22. What are the four categories of fully permitted landfills.
-
-
-
-
-
-
-
-
23. Contained landfills meet Federal _____ requirements for Municipal Solid Waste landfills.
24. There are different technical requirements for each of the four types of landfill.
True or False

25. All solid waste landfills must include the following information on the technical application:
- _____
- _____
- _____
- _____
26. Residual landfills are designed and operated for the disposal of a _____ and the design will vary.
27. After the Division accepts the owner's closure certification for a residual landfill, the facility must be maintained and monitored for a minimum of _____ years.
28. Design requirements for a construction/demolition/debris landfill provide for _____ of surface water flow and leachate.
29. Construction/demolition/debris landfills must have a minimum _____ gallon leachate collection tank.
30. Construction/demolition/debris landfills must document coverage of _____ foot/feet of compacted cover at the end of the week; or, on lifts of 10,000 square feet.
31. A shelter for construction/demolition/debris landfill personnel must include: _____, _____, _____, _____, and _____.
32. The liner for a construction/demolition/debris landfill must cover the _____ and _____.
33. The final cap for a construction/demolition/debris landfill consists of (give inches and slope):
- _____
- _____

34. When the applicant restricts the waste to non-putrescible wastes and wastes that will not leach, the liner and cap may be modified to remove the _____.
35. A _____ landfill may not be constructed within a 100-year floodplain.
36. For a contained landfill, sufficient equipment must be on site to compact wastes received within _____ hour(s) of receipt.
37. The design for a gas venting system in a contained landfill must have a minimum of _____ vent(s) per acre to be land filled.
38. Internal roads in a contained landfill must be all weather and designed within _____ feet of the working face.
39. A shelter for contained landfill personnel must include:

40. A contained landfill has a safety and communication plan which addresses: _____ safe operation and maintenance to prevent accidents and breakdowns; _____
Description of:

41. The liner system for a contained landfill consists of a secondary and primary liner. List the components of each including the requisite number of inches where applicable:
- | Secondary Liner | Primary Liner |
|-----------------|---------------|
| _____ | _____ |
| _____ | _____ |
| _____ | _____ |
| _____ | _____ |
| _____ | _____ |

42. The final cap of a contained landfill must maintain a slope between _____ and _____ percent.

43. For a contained landfill, closure must begin within _____ days following final receipt of waste.

44. The final cap of a contained landfill consists of (give inches where applicable):

45. After the Division accepts the certificate of closure, the owner must alter the deed to notify all potential purchasers of:

CHAPTER 5

SOLID WASTE DECOMPOSITION AND ITS CHEMICAL BY-PRODUCTS

This section describes the decomposition of waste into landfill gas and leachate, differential settlement, its impact on the environment, methods of control and applicable regulations.

WASTE DECOMPOSITION

Wastes are decomposed both through chemical reactions with landfill liquids and the action of bacteria and other microbes that occur naturally in the environment. Organisms feed on organic materials found in garbage breaking them down into end products consisting primarily of:

- CO₂ (carbon dioxide),
- NH₄ (ammonia),
- CH₄ (methane),
- Humus, and
- H₂O.

The biological decomposition of solid waste follows three distinct phases:

PHASE 1:

The microorganisms slowly degrade the complex organic portions of the waste using the O₂ trapped during the landfilling process to form simpler organic compounds, CO₂ and water. This phase is termed aerobic decomposition.

PHASE 2:

After the CO₂ is fully consumed, bacteria grow and decompose waste into simpler molecules such as hydrogen, ammonia, CO₂ and organic acids. This second phase is step one of the anaerobic phase.

PHASE 3:

In the third decomposition phase (step two of anaerobic phase), CH₄ forming bacteria (methanotrops) utilize CO₂, hydrogen and inorganic acids to form CH₄ gas and other products.

Chemical reactions between wastes placed in landfills may also take place producing volatile constituents.

Complete decomposition may take fifty years or more. However, conditions are such that rapid decomposition occurs mainly within the first five years.

LANDFILL GAS

The gaseous end products produced in the most significant quantities are as follows.

CARBON DIOXIDE

- Is highly soluble in water, forms carbonic acid,
- Dissolves iron from metal cans and lime from materials containing calcium,
- Increases the hardness of water (including groundwater), and
- Is odorless and colorless.

METHANE

- Travels upward through fill or along the path of least resistance into the atmosphere, pipes or building,
- Not very soluble in water,
- Explosive, and
- Odorless, colorless and tasteless.

HYDROGEN SULFIDE

- Creates odors (rotten egg) and a foul taste when dissolved in water, and
- In the presence of dissolved oxygen in the water, sulfide will be oxidized to tasteless and odorless sulfur and sulfates.

ENVIRONMENTAL IMPACT

There are increasing concerns with the emissions of Landfill Gas (LFG) and its contribution to air pollution since volatile emissions from landfills represent a major source of organic contaminants entering the atmosphere. The concerns are based on the following:

- CH₄ gas is highly combustible, making it a potential hazard in the landfill environment, or in structures on adjacent properties,
- LFG is capable of migrating significant distances through soil, thereby increasing the risk of explosion and exposure. Serious accidents resulting in injury, loss of life and extensive property damage may occur where landfill conditions favor gas migration,
- As LFG is produced, the pressure gradient upward may create cracks and disrupt the geomembrane in the landfill cover,
- CH₄ gas is an asphyxiant to humans and animals in high concentrations. Migrating gas may result in other adverse effects such as stress to vegetation by lowering the O₂ content of soil gas available in the root zone,
- Gas generated at landfills and vented to the atmosphere frequently release nuisance odors causing annoyance to individuals residing nearby,
- Emissions of Non-Methane Organic Compounds (NMOC) and Reactive Organic Gases (ROG), contained in LFG, may be contributing to the degradation of local air quality. NMOC's include:
 - ✓ Benzene,
 - ✓ Toluene,
 - ✓ Ethyl benzene,
 - ✓ Vinyl chloride,
 - ✓ Dichloromethane,
 - ✓ Trichloroethylene,
 - ✓ 1,2,-cis Dichloroethylene, and
 - ✓ Tetrachloroethylene.
- Where landfills contain sources of sulfur, such as shredded construction/demolition material and gypsum board, there is increases potential for liberation of H₂S, which is noxious at low concentrations and can cause asphyxiation if gas is migrating to enclosed areas,
- Vinyl chloride from landfills has been found to be present in substantial concentrations in LFG's and has been detected in off site conduits, representing health and safety concerns. Vinyl chloride is found in municipal as well as commercial solid waste landfills,
- CH₄ gas, one of the "green house gases", contributes to the possibility of global warming of the earth's climate, and
- Uncontrolled LFG is a loss of potential resources. Instead it can be a satisfactory fuel for a wide variety of applications. Many types of energy equipment designed for conventional fuels can operate on LFG with the power output reduced about five to twenty percent.

LEACHATE GENERATION

In addition to the gases, landfills produce leachate. The amount of leachate generated is directly affected by the amount of water that is allowed to enter the fill.

Water can enter the fill through:

- Moisture and liquids contained in wastes,
- Poor surface water control,
- High water table, and
- Inadequate cover.

The entire landfill does not have to be saturated for leachate to be produced especially when water enters the fill from below.

Leachate usually contains elevated levels of:

Iron	Organic Carbon (TOC)
Chloride	Dissolved solids
Sodium	Phosphorous
Calcium	Nitrogen
Magnesium	Biological Oxygen Demand (BOD)
Sulfate	Acid
Metals	

Many studies indicate that leachate often contains Volatile Organic Compounds (VOCs). In 1988, EPA prepared a Congressional report on solid waste disposal. In this report, leachate studies from 70 municipal landfills were combined to characterize landfill leachate. The studies reported finding 82 chemicals in landfill leachate, including 63 types of organic chemicals. In the 70 landfill studies, concentrations of VOCs in leachate varied widely, but the researchers were able to calculate a median concentration for each chemical by averaging all of the data. Of the fourteen chemicals whose median concentrations exceeded federal drinking water standards, twelve are known or probable carcinogens and two are considered toxic to humans (see Table 1 for a list of common VOCs)².

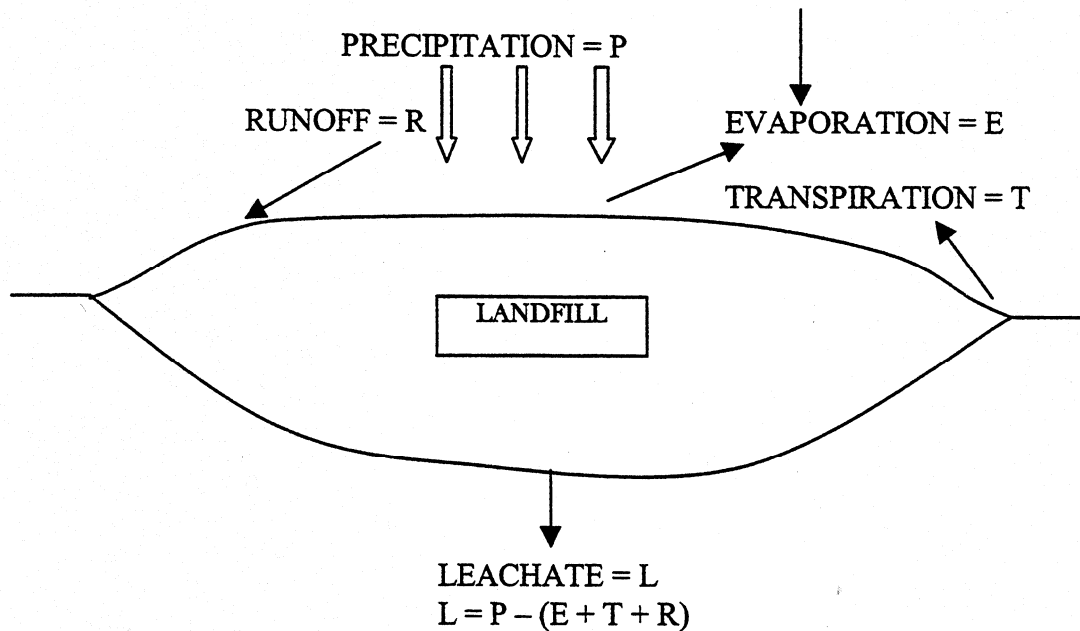
Therefore, the manager must ensure the proper pumping, hauling and treatment of landfill leachate in order to protect human health and the environment.

FIGURE 5-1

TABLE 1 Health Effects of Selected Volatile Organic Chemicals Found in Landfill Leachate	
Benzene	Human carcinogen, mutagen, and possible teratogen; central nervous system (CNS), peripheral nervous system, immunological and gastrointestinal effects; blood cell disorders; allergic sensitization; eye and skin irritation
Chloroform	Probable human carcinogen and possible teratogen; CNS and gastrointestinal effects; kidney and liver damage; embryotoxic; eye and skin irritation
1,1-dichlorethane	Embryotoxic; CNS effects; kidney and liver damage
Ethylbenzene	CNS effects; kidney and liver damage; upper respiratory system, eye and skin irritation
Methylene Chloride	Possible carcinogen; CNS, lung/respiratory system and cardiovascular effects; blood disorders; eye and skin irritation
Tetrachloroethylene	Probable carcinogen; CNS and lung/respiratory effects; embryotoxic; kidney and liver damage; upper respiratory tract and eye irritation
Toluene	Possible mutagen and carcinogen; CNS and cardiovascular effects; kidney and liver damage; upper respiratory tract, eye and skin irritation; and allergic sensitization
Trichloroethylene	Possible carcinogen and teratogen; CNS , kidneys, liver, cardiovascular system, and lung/respiratory system effects; blood cell disorders; skin, eye and upper respiratory irritation
1,1,1-trichloroethylene	Carcinogenic; mutagenic; CNS and lung/respiratory effects; kidney and liver damage; eye and skin irritation
Vinyl Chloride	Carcinogenic; mutagenic; possible teratogen; CNS effects; kidney and liver damage; blood cell disorders; skin irritation
Xylene	CNS and cardiovascular effects; kidney and liver damage; upper respiratory and eye irritation

SOURCE: Adapted from *The Poisoned Well* (Sierra Club Legal Defense Fund, 1989)

FIGURE 5-2



MOVEMENT OF GAS AND LEACHATE

Gas and leachate follow the path of least resistance and move more freely through permeable materials. Examples of highly permeable materials are sand and gravel, which are large grained and have enough air space between grains to allow water and gas to move easily. Clay and shale have low permeability and slow the passage of water. Several factors contribute to the effect that contaminants, found in leachate, may have on the environment:

- Permeability of surrounding soils or the ability of soils to allow liquids to pass through,
- Layers of rock under the site,
- Ability of the soil and rock layers surrounding the site to physically filter or form a chemical bond with contaminants,
- Depth of water table,
- Direction and rate of groundwater flow, and
- Concentration of contaminants.

Figure 5-3

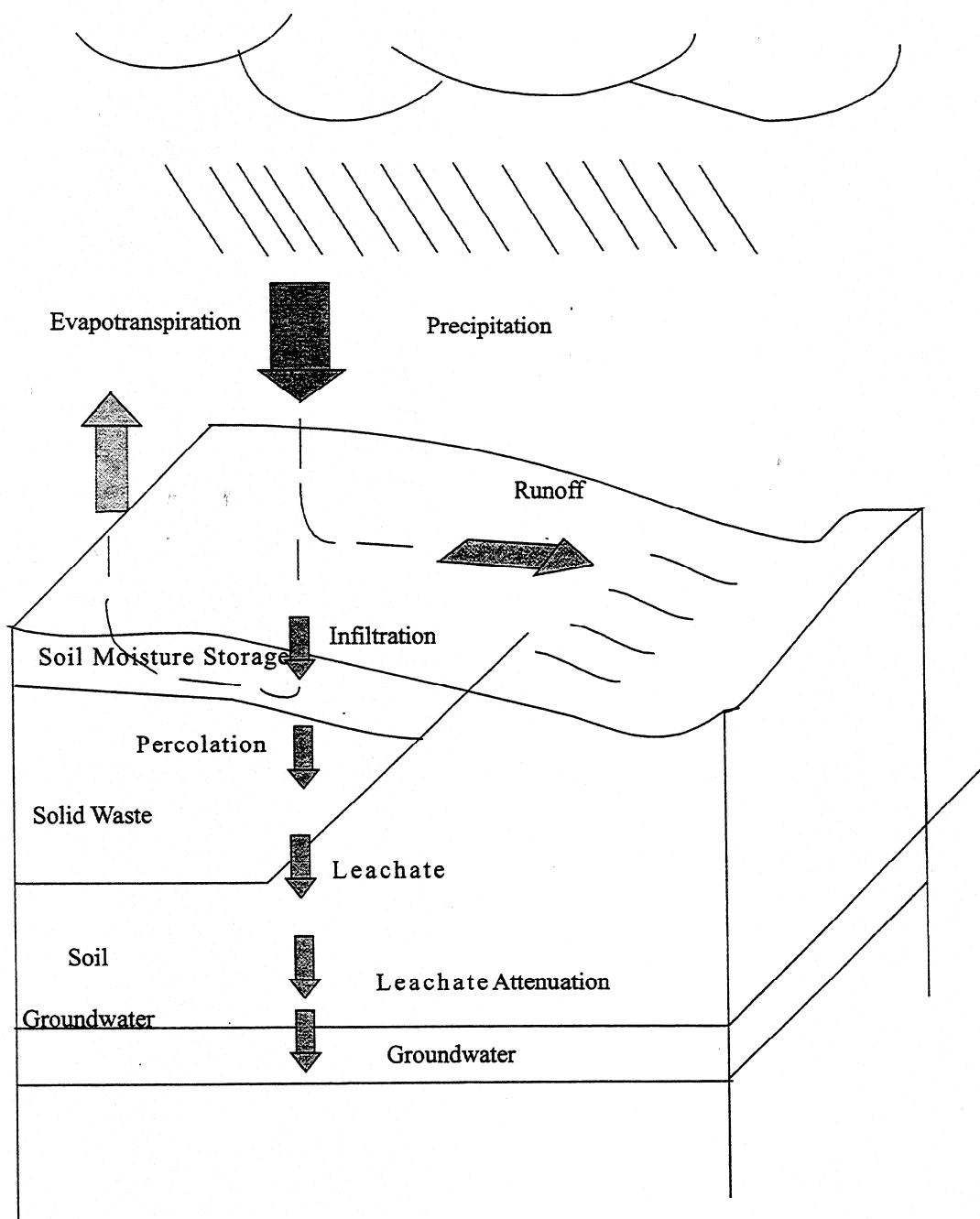
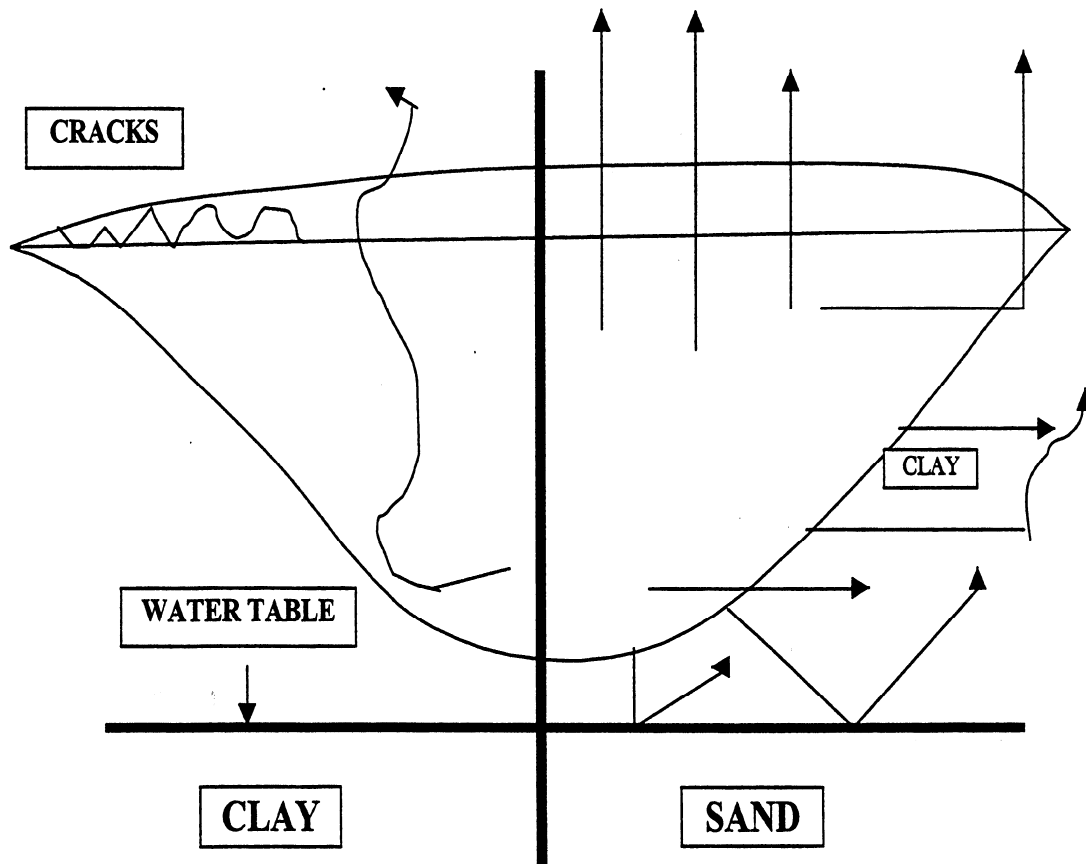


FIGURE 5-4



The presence of restrictive layers including frost, saturated soil, clay or synthetic caps will reduce vertical and potentially increase horizontal migration.

GAS CONTROL

Generally, there are two types of systems to control migration of landfill gas. These are active and passive systems.

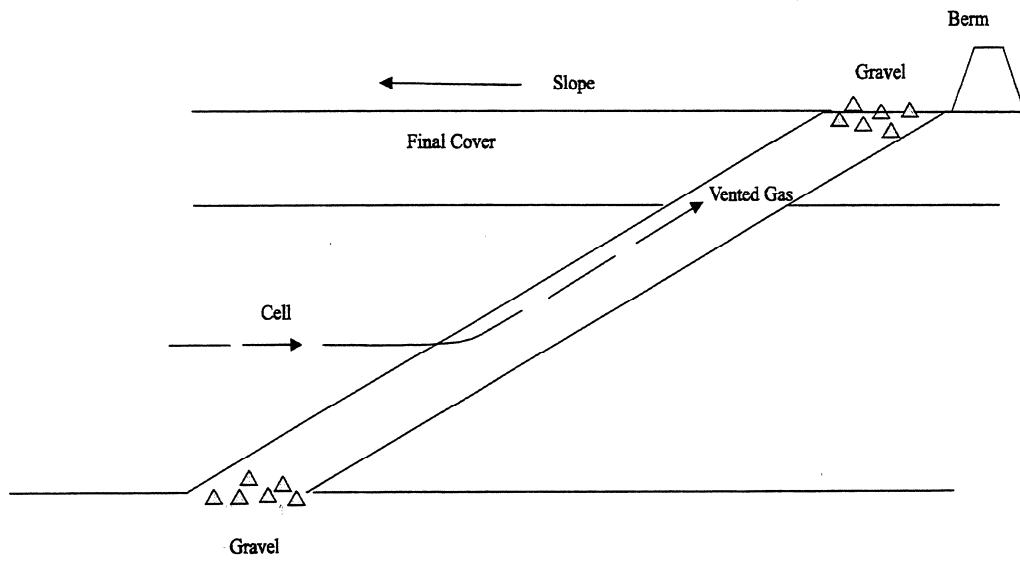
PASSIVE SYSTEMS

These are vents or barriers built into or adjacent to the fill that collect gas for release to the atmosphere.

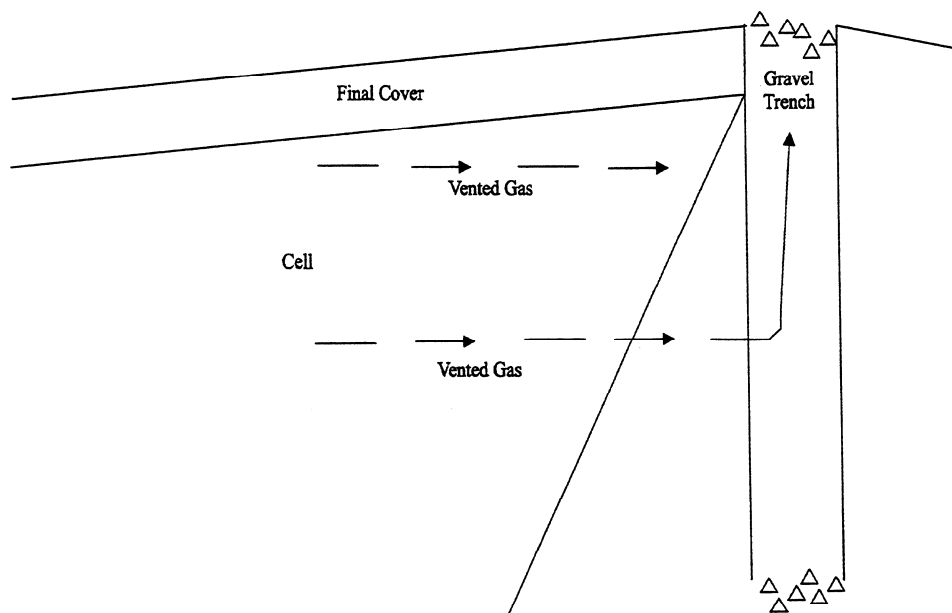
ACTIVE SYSTEMS

These are a series of pipes connected to a blower to draw methane out of the landfill and collect it for flaring or energy use.

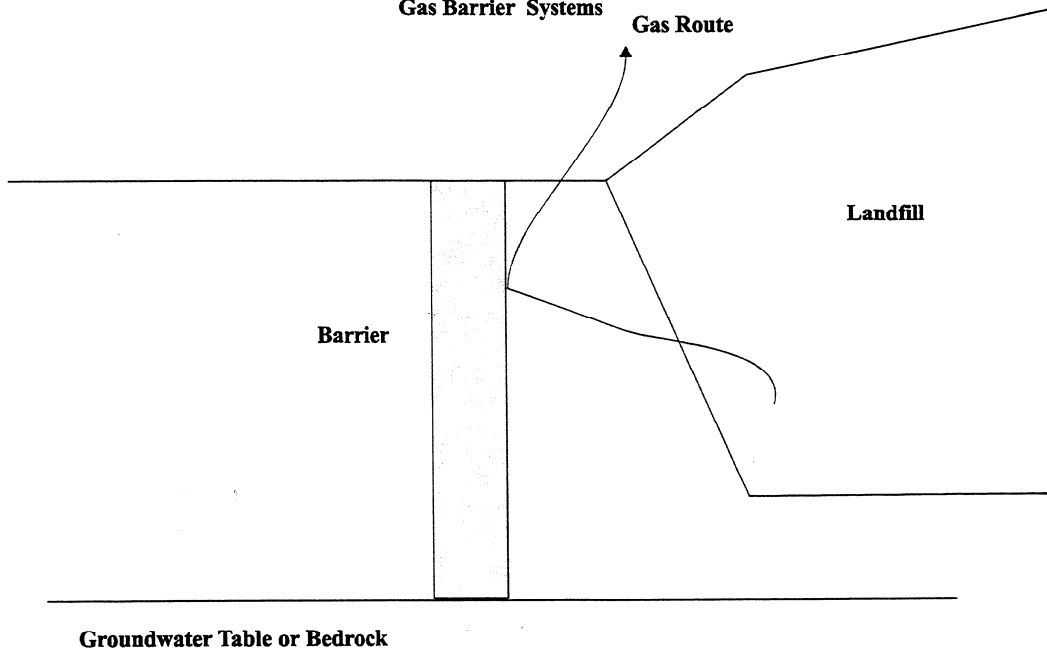
Figure 5-5
Passive Venting Systems



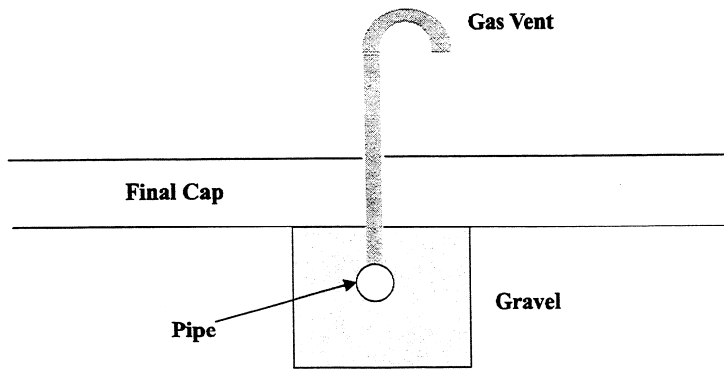
System for Residential, Residual, Special Waste and Non-Putrescible CDD Landfills



**Figure 5-6
Gas Barrier Systems**



**Figure 5-7
Passive Pipe Design**



LEACHATE CONTROL

The most effective method of leachate control is to provide good drainage, high compaction of wastes and practice good surface water management. Newly developed contained landfills are required to install leachate collection systems. As discussed in Chapter 4, a composite liner consists of a leachate collection system. This system includes drainage provisions to promote runoff, pipes to provide collection of leachate flowing vertically and horizontally, and a tank for storage of the liquid collected until removal or treatment may occur.

Figure 5-8
Active Methane Control System

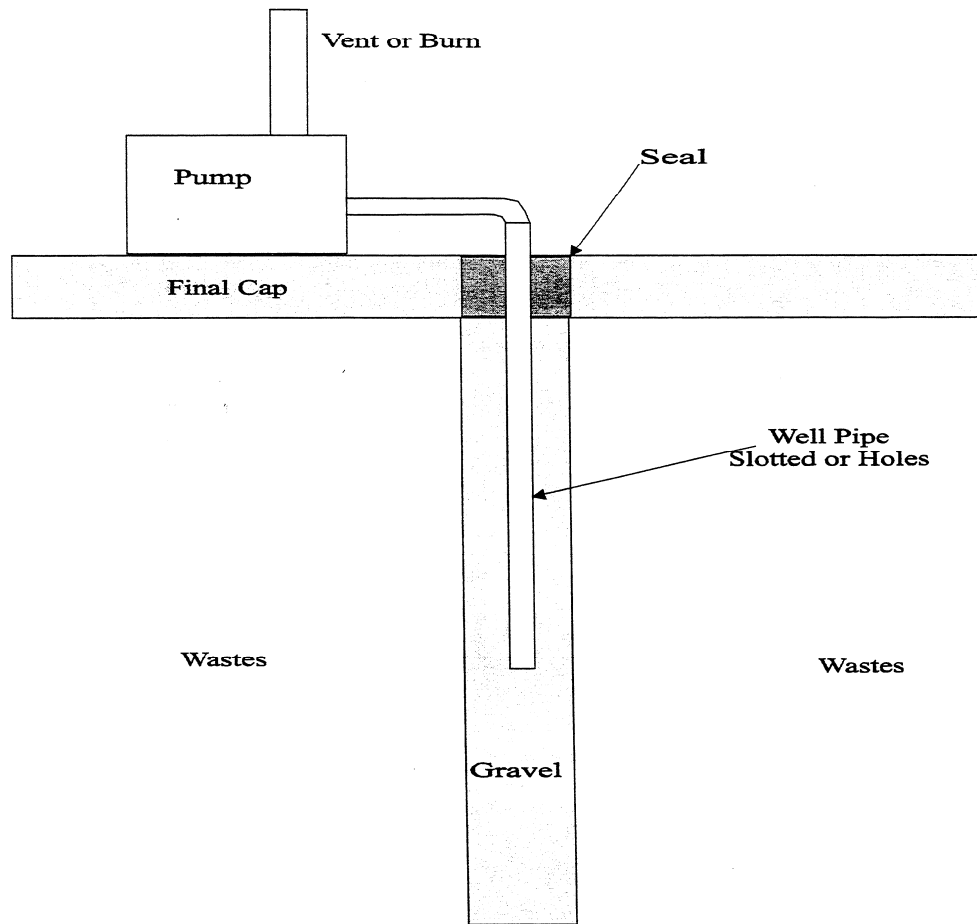


Figure 5-9a
Surface Water Control Methods

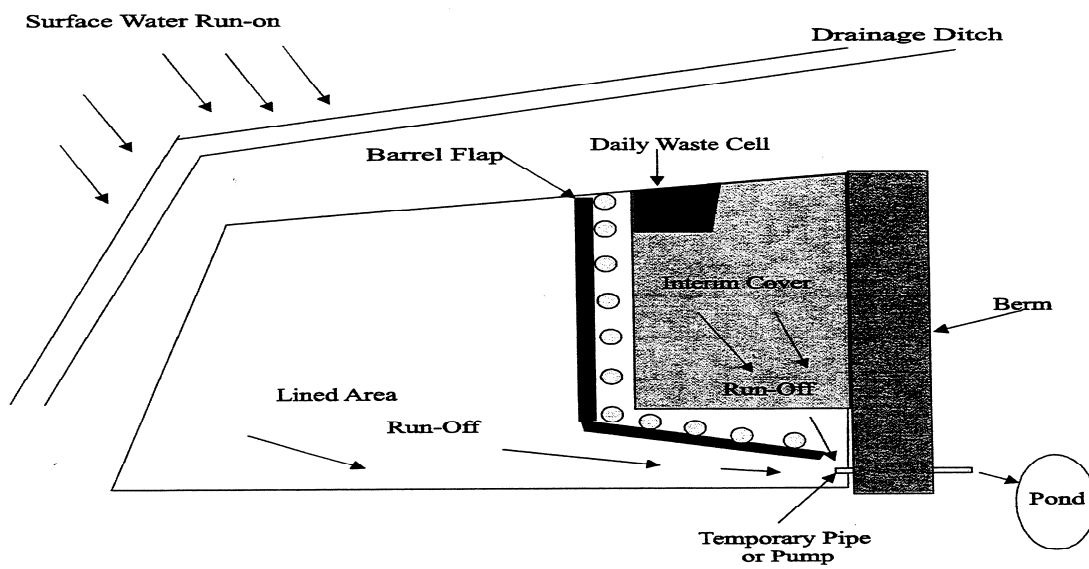
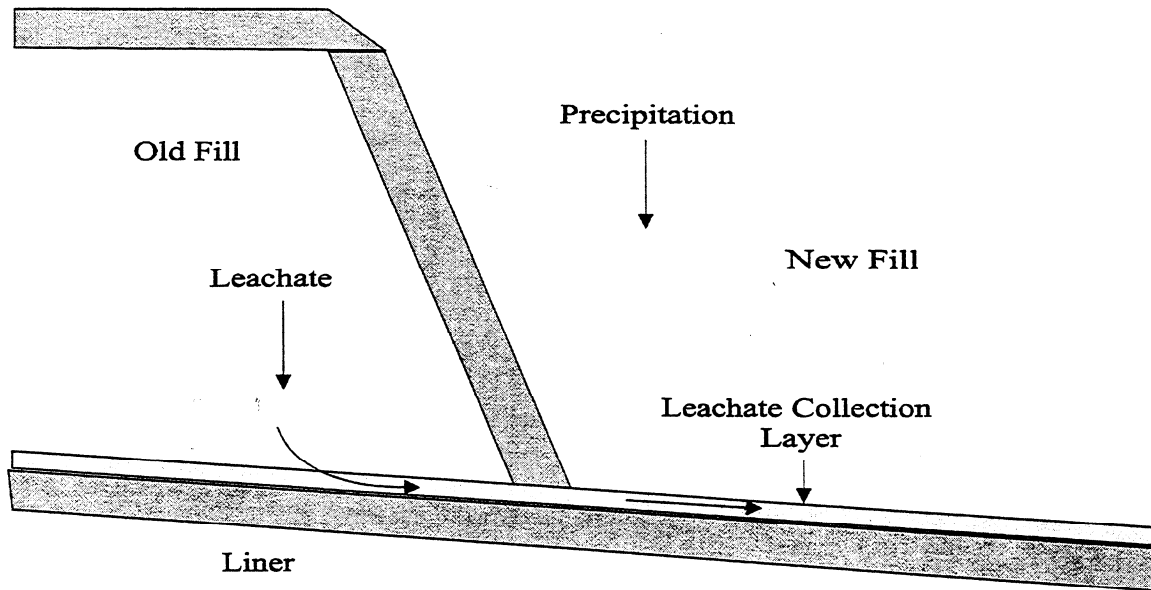


Figure 5-9b
Drainage Control Using Berms

Wrong:



Right:

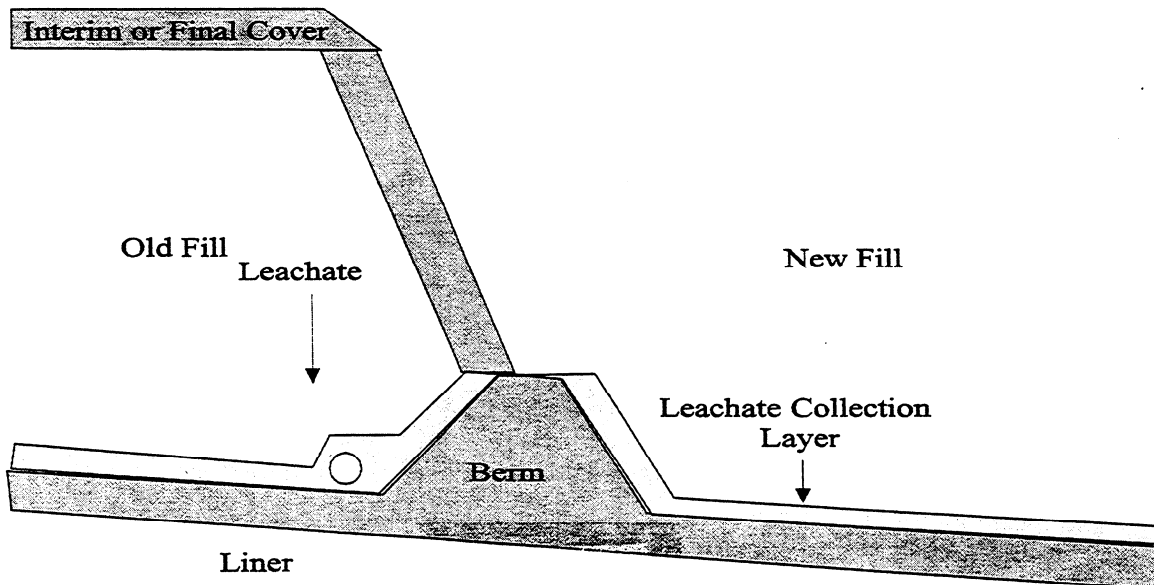


Figure 5-10
Landfill with Leachate Collection

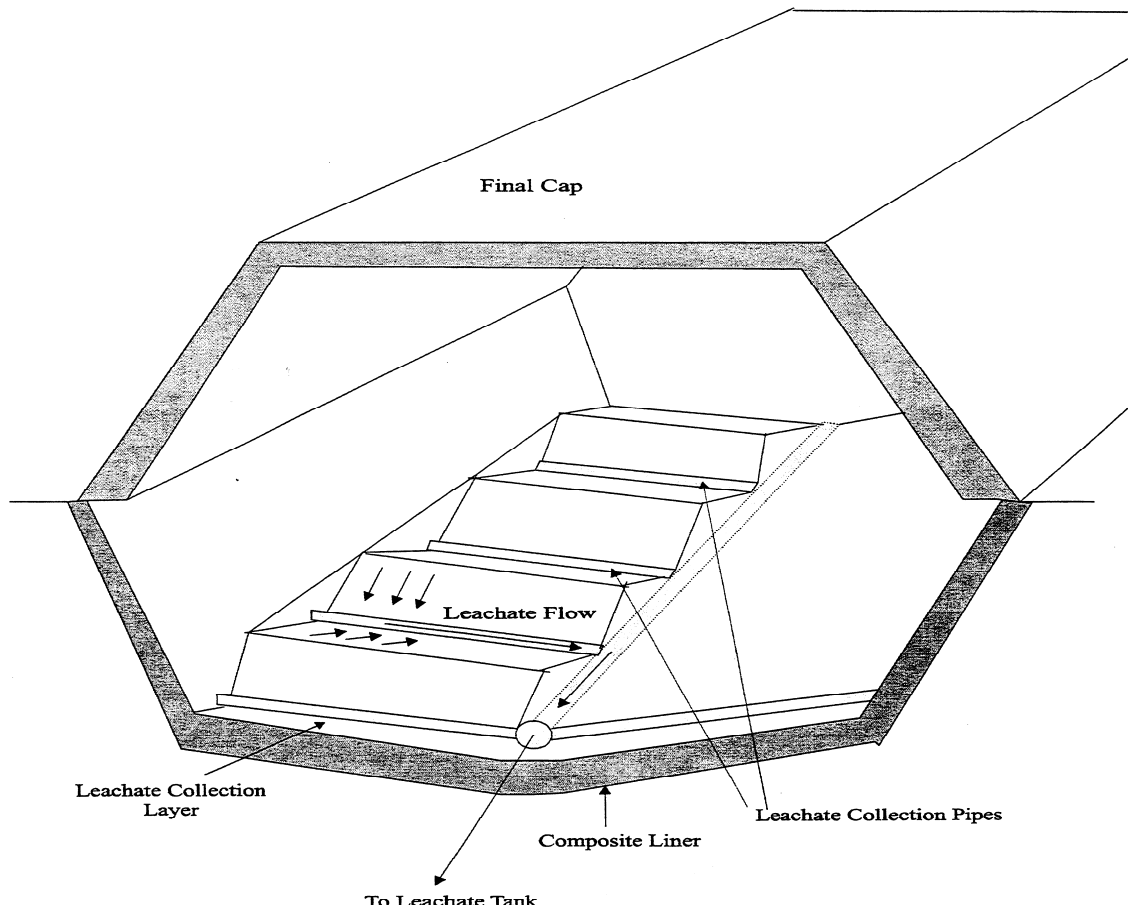


Figure 5-10 shows a cross section of a landfill with a leachate collection system installed.

LAND SETTLEMENT

The amount of settlement that will occur is dependent on several factors:

- Type of refuse,
- Depth of refuse,
- Amount of compaction,
- Rate of decomposition,
- Moisture content, and
- Loading.

There are two types of settlement – subsidence and differential.